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EDITED IN ENGLISH AND GERMAN

BY

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AND

DR. J. HIRSCHBERG
OF BERLIN

IN CONJUNCTION WITH

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ARCHIVES OF OPHTHALMOLOGY.

COLOR-PERCEPTION AND COLOR-BLINDNESS.

By Dr. SWAN M. BURNETT, Washington, D. C.

A THEORY of color-perception, in order to be acceptable, should account consistently and in a satisfactory manner for all the phenomena of colored-vision and color-blindness. I take it to be a generally conceded fact that neither of the two at present prominent hypotheses do this.

According to Mauthner,* the evidences which the phenomena of color-blindness bring against the three-fibre theory of Young-Helmholtz are:

1. That the red-blind cannot distinguish perfectly the greens and violets, nor the green-blind the reds and violets; yellow and blue being the only colors they can unerringly select.

2. Even in a spectrum that is very much shortened, the red-blind finds the brightest place—not in the bluish-green, as we should expect, but in the yellow, as the normal eye does.

3. This theory cannot satisfactorily explain the extreme shortening of the spectrum, extending, as it does sometimes, into the orange, and even into the yellow.

In addition, we have the results of the examination of a number of color-blind by various methods, by Prof. Pflüger, published in Vol. ix, No. 4 of these ARCHIVES, which show:

* Vorträge aus dem Gesammtgebiete der Augenheilkunde, Heft 4, 1879.

4. That some persons who are red-blind by one method of examination are green-blind by another; that the green-blind, for example, by one method of examination have a shortening of the red end of the spectrum.

5. The gray or neutral band is far from being invariably present, and when it is, it is often in the red-blind in the position it should be in the green-blind, and *vice versa.*

Against the Hering theory, the following objections have been advanced by Donders: *

1. White and black may (generally speaking) be opposed to each other, as A and D; but there is no reason for opposing in the same way R and G and Y and Bl. In fact, they all four are active in their specific line. All are in the same relation to D and A. Each of them is opposed to A, corresponding to Bk, the negative of Wt, and of every color.

2. The *simple* colors are not *complementary*, as Hering asserts. The complementary of R is not G, but bluish-green; that of Y not Bl, but violet-blue. How, then, can they be considered antagonistic, as in Hering's theory they are?

3. The complementary colors (the two colors of Hering's pairs) do not annihilate each other, but combine into white. This is proved by mixture. *E.g.*, in a double spectroscope, violet (a saturated color) and intense yellow, covering each other half-way, produce a white manifestly more intense than the yellow.

4. White is not an independent sensation; it is absent in the spectrum where, in red-blindness or violet-blindness, the specific color is absent.

5. The theory of Hering is insufficient to account for the different forms of color-blindness.

From the results of an examination of a large number of color-blind, two important facts are forced upon the attention of the unbiassed observer:

1. That there is no fixed law governing the phenomena; all cases cannot be classed as distinctly red-, green- or violet-blindness, though it seems quite probable that all

* *Brit. Med. Jour.*, November 13, 1880.

might be classed under the heads of red-green blindness and blue-yellow blindness (Hering).

2. That neither one of the two hypotheses fulfils the demands of an acceptable theory, inasmuch as they fail to account consistently for all the phenomena.

In the consideration of congenital color-blindness I think too much stress has been laid on the part the retina plays in color-perception, to the exclusion of other factors. It must be remembered that there are three distinct agents at work in the perception of colors: The luminous impression is received first upon the retina; it is carried thence by means of the optic-nerve fibres to the cerebral centre of vision, and it is there converted into a sensation. Let any one of these agents become deranged as to its function, and there will be a perversion or absence of sensation. The retina may be in perfect condition to respond promptly to the action of light, and yet if the optic nerve cannot carry the impression to the brain, or if the latter is unable properly to take cognizance of it, there will be no proper sensation. It would be perfectly legitimate, then, theoretically, to divide color-blindness into *peripheral* and *central.* Unfortunately, we are not yet in the position to make, in all cases, a differential diagnosis between these two forms. It seems a justifiable supposition that the modification in color-perception accompanying the condition of hypnotism, is due to an alteration in the molecular state of the brain centre of vision, as we likewise have it in certain toxic conditions.

Two very strong objections to both the theories of colors are: 1st, their want of simplicity, and, 2d, the lack of any analogous reactions in any other of the organs of sense, and the necessity for inventing new tissues and novel reactions of tissues to affecting agents.

We are fully justified, I think, in assuming that the true theory of colors, when found, will be simple, and that it will conform to the known and demonstrated laws governing the action of light on simple bodies, and in our opinion it will be found to lie in the direction pointed out by recent experiments on the action of light on the molecular condi-

tion of certain substances; and, moreover, we believe, quite contrary to the present accepted opinion, that *variation in sensation will have its basis, not in complexity of tissue, but in the varying action of the affecting agent.*

In framing a theory of colors on this basis, we would suppose the retina to be a body whose molecular substance would respond with promptness to all the separate wave-lengths of light which are distinguished as individual colors; the alteration produced by each of these wave-lengths would be conveyed by the optic nerve to the brain centre of vision as a distinct impression, and converted by that into a sensation clearly individualized. This is to a great extent going back to the original theory of Newton, who considered that the "rays impinging upon the ends of the optic nerve excite vibrations which run through the optic nerve to the sensorium. Here they are supposed to affect the sense with various colors according to their bigness and nature." The objection Young urged against this idea was that the frequency of these vibrations must be dependent on the constitution of the substance of the retina, and it was almost impossible that every sensitive point could have an infinite number of different particles to respond to this infinite number of vibrations. He therefore supposed the number limited to three, corresponding to red, green and violet. In our opinion this objection of Young is not valid, because we know that there are membranes which can respond to an almost infinite number of aerial wave-lengths at the same time, and we have every reason to suppose, from analogy, that the retina may be a substance whose molecular structure is so delicately and peculiarly organized as to allow it to respond promptly and separately to all the wave-lengths of light embraced in the visible solar spectrum. We have a reaction to light exactly similar to this in the metal selenium when in a crystalline condition, and in some other substances—the photophone, indeed, depends upon this very delicate reaction of selenium to light, for its existence. By allowing the retina to be such a substance—but with a molecular structure more delicately fashioned than any other yet known,—we have the basis of a theory of colors

which is simple, and in perfect accord with the known reaction of simple substances to light, and we are removed from the necessity of inventing new tissues and unknown reactions of tissues to light.

It is to be remembered, too, that heat and light are the manifestations of the undulatory motion of the same ether, differing only in degree and not in kind, and it is very possible that the optic nerve and retina are but highly specialized forms of a nerve of common sensation—in fact, in certain of the lower forms of animals the cutaneous nerves seem to respond in quite a delicate manner to the action of light. If the nerves of common sensation are affected by heat as to their molecular structure, and this change is transmitted to the cerebral centres and there turned into a sensation, it is quite allowable to suppose that a very high specialization would enable one to respond to such slight variation in the affecting agency as is represented by differences in the wave-lengths. This extremely delicate organization would very naturally incapacitate it from responding to the coarser waves, and we find, consequently, the capacity of the retina for responding to ether waves limited to the comparatively few embraced in the solar spectrum, the ultra-red and ulfra-violet having no power to affect it.

In this theory white would be represented by the sum of the impressions which the retina is capable of receiving; black, by the absence of sensation. The colors would be divided into primary and secondary, according as they represented individual impressions of certain wave-lengths, or were the mixture of two or more sensations. Which are the primary colors would have to be determined by experiment, but it seems probable that the individual wave-lengths, represented by the principal colors of the spectrum, red, orange, yellow, green, blue and violet, would be those to which the molecular structure of the retina definitely and separately responds, and in such a manner as to give rise, when carried by the nerve to the brain, to distinct sensations; at least we would suppose the wave-length represented by each of these colors to set up a distinct indepen-

dent molecular change. But no matter what may be the number of primary colors finally found, they will, we are sure, not be found to be represented by the action of light on a corresponding number of special nerve fibres or chemical substances, but will be produced by the action of different wave-lengths of light on the general molecular structure of the substance of the retina.

We will not here follow out the application of the theory to all the phenomena of colored vision, but will simply apply it to the elucidation of the manifestations of color-blindness.

With that form of color-blindness which we have designated as *central* the retina has nothing to do. The impressions produced by the separate wave-lengths may be carried properly to the brain centre, but this centre, from some defect in its molecular structure—probably want of development,—has not the power to differentiate between the separate impressions. I would class under this head all those who see the spectrum dichromic, and probably some others. It is certain that in the majority of such cases all the wave-lengths *do* produce an impression on the retina, because only a limited number see the spectrum shortened, when it is sufficiently luminous. It will be noted that these persons class all to the left of a clearly marked line, usually the line separating the blue and green, as being of one color, and are unable to see any lines of division, as the normal eye does, between the red, orange, yellow and green; nor are they able to see any separation between the blue and violet, and the place of maximum intensity is usually, as in the normal eye, in the yellow. If the colors on each side of the division are not properly distinguished, it must be because the cerebral centre is not able to make the differentiation.

One broad general principle may be laid down, I think, which will cover all cases of retinal or peripheral color-blindness as distinguished from cerebral or central, and that is, that in such cases the molecular structure of the retina is such as to allow it to respond feebly or not at all to light-waves of certain lengths. Such cases I believe to be rare

in comparison with the other variety, but when we consider how delicate must be the molecular structure of the substances which are thus so sensitive to the action of etherial undulations, we can readily imagine a very slight change in their structure productive of marked results as regards their reaction to light-waves. In this category would fall the color-blindness attending diseases of the retina, and some of those cases where the spectrum is shortened. The color-blindness accompanying optic-nerve disease would also be peripheral, and due to the loss of power, from molecular changes on the part of the nerve, to carry certain changes made in the retina to the brain.

RESULTS OF EXAMINATIONS FOR COLOR-BLINDNESS IN DENMARK.*

By Dr. O. E. de FONTENAY, Copenhagen.

THE work was first undertaken in testing railway employés, and subsequently for a prize offered by the Royal Scientific Society of Denmark, with the purpose of obtaining accurate data as to the prevalence of color-blindness in Denmark.

All the color-blind found have been grouped under the red-blind, green-blind, violet-blind, and incompletely color-blind, in conformity with Holmgren's classification. Those with simply *feeble* color-sense have not been included in the lists.

No case of total color-blindness was found. Three violet-blind, according to Holmgren's test, were discovered; but there is some doubt whether these would be so declared by Seebeck's or Stilling's method.

As the work was commenced with railroad employés, the colors red and green were naturally especially attended to.

The two cases of violet-blindness found in Jytland and Seeland could not be seen again for further examination.

There were some special points the author had in mind from the commencement, his experience upon which will be published later when the data are more complete.

Including adults and children, there were 9,659 persons

* Abstract of an article published in the *Nordiskt Medicinskt Arkiv*, Bd. xii, 1880, and a prize essay granted by the Royal Society of Denmark. Arranged by Dr. B. Joy Jeffries at request of author.

tested. These were in all parts of Denmark, town and country, and of all classes, including the military, sailors, policemen, tradespeople, mechanics, and the children in public and private schools. The prevalence of color-blindness in the several classes may be, therefore, more fairly judged.

The ages were from 8 to 60–70; at a time, therefore, when a knowledge of colors may be granted. Of the 9,659 tested, 217 were color-blind, viz, 2.25 per cent. A smaller number were found among the educated than the uneducated, showing the necessity of trying all classes to obtain a general average.

In the following table it will be seen that for 1,001 educated the per cent. is 3.09, and for 3,491 uneducated, 3.87. These latter were mechanics, laborers, and farm hands.

TABLE I.

Class.	No. Ex.	Red-blind.	Green-blind.	Violet-blind.	Incompletely Color-blind.	Total.	Per cent.
Educated	1001	11	4	0	16	31	3.09
Uneducated	3491	31	17	2	84	134	3.87
Total	4492	42	21	2	100	165	3.70

The following, Table II, gives the proportion in various situations:

TABLE II.

Situation.	No. Ex.	Red-blind.	Green-blind.	Violet-blind.	Incompletely Color-blind.	Total.	Per cent.
Railway	2737	26	16	0	40	82	3.00
Foresters	183	3	1	0	13	17	9.28
Prisoners	242	3	0	0	6	9	3.72
Mechanics—Tradespeople	930	8	3	1	19	31	3.22
Factory hands	400	2	1	1	22	26	6.50
Total	4492	42	21	2	100	165	3.70

It is difficult to decide whether higher education influences the percentage, or practice with colors, or hereditary weakness. And it is not always possible to draw the line between educated and uneducated. Other examiners have reported variations with the classes tested. Magnus,[1] for instance, found among 2,002 children of the better class only 53 or 2.65 per cent. color-blind, whilst among 1,055 of the lower class 46 or 4.36 per cent.

Cohn,[11] among 1,424 children of the better class, 47 or 3.35 per cent., and among 1,005 public-school children, 48 or 4.08 per cent.

Holmgren,[3] among 8,682 children of the better classes, 300 or 3.45 per cent., and among 3,854 public-school children, 166 or 4.54 per cent.

Jeffries,[4] among 14,469 children of public schools of Boston, 608 or 4.202 per cent.*

It is also to be noted that Holmgren[3] reports among 1,523 students, 47 or 3.08 per cent., whilst among 649 factory hands, 31 or 4.77 per cent.

Dr. Carl,[6] of Frankfort-on-Main, found among public-school children 3.5 per cent., and only 0.67 per cent. among children of better classes.

The author attempted to ascertain if there was any difference in the different parts of Denmark. This, however, was difficult on account of the small numbers and the subdivision into classes.

TABLE III.

Province.	No. Ex.	Red-blind.	Green-blind.	Violet-blind.	Incompletely Color-blind.	Total.	Per cent.
Jytland	1847	20	9	1	16	46	2.49
Tyen	357	1	4	0	5	10	2.80
Seeland	1080	8	5	0	22	35	3.24 } 2.15 per cent.
Copenhagen	6375	26	7	1	91	125	1.96 }

* Dr. O. E. de Fontenay desired a correction to be made here, so the above numbers are from the Report to School Board, Document No. 13, 1880. The High Schools mentioned in the manual were mistaken for schools of higher social grade.

Table III gives the results by provinces. The slight differences may be quite accidental, however. Heredity, for several generations, will have its local effect on the percentage. The author's tests of such families have not, however, given greater percentage. Yet the numbers may be too small, and more extended data must be waited for. As a family defect it must be increased by intermarriage.

The per cent. is small for Copenhagen, as so many women were tested there, which was not possible in other parts of the country. The adults were officials and from private life, of various ages. It was seen to that they had no affection causing color-blindness. They numbered 6,945; of these 4,492 men and 2,453 women. Among them, in all, 176 color-blind or 2.56 per cent.

Of railway employés, 3,239 have been tested, including 502 women. Of the 2,737 men, 82 or 3.00 per cent. were color-blind, and of the 502 women only 3 or 0.6 per cent.

The author particularly desired to compare the two sexes, but his opportunities of testing women were limited and confined principally to hospitals, factories and prisons; 2,453 have been examined, and of this number 11 were color-blind, or 0.45 per cent. Adding the girls tested, and the whole number is 3,819 with 16 color-blind, or 0.42 per cent.

Opposed to this are 165 or 3.70 per cent. C. B. among 4,492 men, or including boys, 201 or 3.44 per cent. among 5,840 males. Thus the male population gives us 3.44 per cent., the female 0.42 per cent., as seen in Table IV.

TABLE IV.

Sex.	No. Ex.	Red-blind.	Green-blind.	Violet-blind.	Partially Color-blind.	Per cent.
Male	5840	54	23	2	122	3.44
Female	3819	2	1	0	13	0.42
Total	9659	56	24	2	153	2.25

Among 632 women of the better classes were no color-

blind. In 1821 others, with 11 cases, the per cent. is 0.60. Including children, 3,187 females of the lower classes were tested, with 16 C. B., or 0.50 per cent. The method employed must be considered in comparing the sexes. The practice women have from their work and dress may increase the men's percentage, the latter not being accustomed to select colors. Education does not have effect here, as otherwise the percentage would be greater the larger the number of children examined. This may be proved by testing the same number of children between 3-4 and 8-16, when age will be found to have no effect, whilst practice will.

The author's conclusion is that the percentage of color-blindness in Denmark (both sexes included) is 2.25 per cent. Were the whole population tested this would be altered, as the last census gives a preponderance of women.* Children as well as adults must be counted, as the defect is congenital and incurable. Being at first in doubt as to how young children could be and give reliable results, the author limited the age to 8 years, at which time they are able to understand what is needed of them. With much younger this would be difficult.

The method employed has considerable influence. The only safe one is Holmgren's with colored worsteds. Possibly Cohn's embroidered letters, or Daae's or Stilling's tables could be used, or some other method with older children. One must explain to children before testing them what is required, and the different colors, as purple, red, etc., must be pointed out, since they will often group all having any red together. An unpractised eye does the same with blue and yellow green, Holmgren's I. Cohn advises using the lighter shades of colors.

As in Denmark children leave school at about 16 years, it is at this age that they are considered to cease to be so, and called adults. This is, however, only of importance in classifying. Dr. Daae regards as children persons between 9-15 years; Jeffries 8-17 years; Cohn from the 8th year upward; Seebeck, Magnus and Holmgren do not mention

* Census of 1880 gives 1,032 women to 1,000 men in Denmark.

any age. In a letter to the author, Holmgren states the age of the children tested in Sweden as from 8 to 15.

The author examined 2,714 children, and found 41 C. B., or 1.51 per cent.; of them 1,348 were boys, with 36 C. B., or 2.67 per cent., and 1,366 girls with 5 C. B., or 0.37 per cent. The difference between boys and men is more than 1 per cent. (2.67 and 3.70). This is, however, of no value, as similar differences have been found among adults. In comparing the percentage in Denmark with other countries it will be found very much the same where similar methods have been used.

The first reports of the percentage of color-blindness are by Seebeck[7] and Wilson.[8] The latter has the greater number. His method of testing and his subdivisions were so different from those now adopted, that his results are of less value He added the two sexes, but yet states that color-blindness is more common among men than women. As he asked the names of colors, thereby greatly favoring women, his results are not of much value.

Dor[9] first published any exact record of the tests of women. By Seebeck's method he found 5 C. B. among 611, or 0.82 per cent. Other examiners have since reported about the same result.

Holmgren[3] found 19 C. B. among 7,119 women, or 0.26 per cent. Daae[10] found none among 208 girls. Cohn[11] did not find any among 1,061 girls. Magnus[1] only 1 among 2,216 school girls, or 0.04 per cent. Jeffries* only 11 cases among 14,557 women and girls examined.

Of the other examiners since Seebeck, Favre[12] reports the greatest per cent., both for boys and girls. The method he used (asking names of colors) explained his results.

These are the percentages from other countries: Dalton, 8.12 per cent.; Wilson, 5.6 per cent.; Seebeck, 5 per cent; Favre, in 1,655, up to 32 per cent.; of more recent tests, Holmgren,[2] 3.25; Magnus,[1] 3.5 per cent.; Jeffries,[4] 4 per cent.; Wolfe,[13] 3 per cent. Such variations are readily explainable by the methods used, the exactness of the observer, etc. Mistakes have thus been made

* The exact number is here given at Dr. de Fontenay's request.

in quoting in one country the results obtained in other countries, and from such mistakes the author does not claim exception. Holmgren's[3] tables show clearly how the method used affects the results obtained. Tests by his method give the smallest percentage and no doubt the most nearly correct. An examiner's capacity for testing and what method he employs, must be taken into consideration when using his results for any scientific data.

In reference to the kind of color-blindness and its relative frequency, there are of the 217 C. B. of the two sexes, 56 red-blind, 24 green-blind, 2 violet-blind, and 135 incompletely or partially C. B. Therefore about double the number red-blind as green-blind. More extended testing may, however, change this proportion. Of the proportion of C. B. in Denmark, the author feels quite sure, having made his tests with great care. In the two sexes the proportion of red- and green-blindness is about the same, whilst incomplete C. B. is more common in females. Holmgren[3] reports the reverse in Sweden, viz.: green-blindness more frequent, contrary to what has been thought. Red-blind, 0.77 per cent.; green-blind, 0.85 per cent., and incomplete C. B., 1.53 per cent.

Jeffries[4]* found in America about the same proportion of red-and green-blind as here in Denmark, though green-blindness was more numerous, viz.: 537 red, 98 green, and 160 incompletely color-blind.

Cohn[11] found 80 per cent. red- and 5 per cent. green-blind.

Cohn and Magnus think green-blindness more common, whilst Drs. Daae, Jeffries and the author found the opposite the case. Violet-blindness is extremely rare. Taking the various examiners' results together, and green-blindness seems more common in Northern Europe. Time changes our knowledge of color-blindness, and whilst formerly red-blindness was considered more common, green-blindness is now proved to be, by recent numerous examinations.

Each eye was tested in the 217 cases reported by the au-

* The corrected numbers are here given at Dr. de Fontenay's request. There are also 15 additional cases of C. B. without present records of the subdivision.

thor, and the two were always found alike. The four monocular cases reported by Niemetscheck[14] must be considered as very doubtful.

The author was quite surprised when he commenced, in 1877, testing railway employés, to find that a large proportion of the color-blind had light complexions, light hair and eyes. Dismissed from mind, the subject again recurred when Magnus and Cohn[11] reported having noticed the same, as had Seebeck. He therefore again commenced to note the complexion of the color-blind, although a friend had assured him that he would find as many with dark complexion.

Seebeck,[7] among his twelve cases, found only two having brown eyes, and thought it was, as in England, because the prevailing national complexion was light.

Magnus[1] says a large majority of his 110 C. B. were light complexioned. Cohn[11] thinks there is no difference; 56 of his 100 C. B. were dark and 44 light complexioned. The color of the eye would therefore seem to have no connection with color-blindness, as recent authors have still further shown.

TABLE V.

Examiner.	Light eyes.	Dark eyes.	Total.	
Hannover—Women	1818	311	2129	3935
Fontenay "	1378	428	1806	
" Men	4199	1312	5511	
Total	7395	2051	9446	

In the 145 cases in which the author noted the color, 125 were light and 20 dark. Of the former, 113 were men and 12 women; of the latter, 16 were men and 4 women. Nevertheless, it is evident that where light complexions prevail in the population, they will among the color-blind. Similar records, but for another purpose, were made by Dr. Raon and Prof. Hannover[15] in regard to women. Hannover's alone can be made use of, as he has noted both the color of the

eyes and hair. His six classes are here combined into two, viz., light and dark eyes. In the first are included light-blue, gray, greenish and reddish; in the second, brown-black and grayish-brown. The author's lists include men and women, mostly adults, from all parts of Denmark.

It will be seen from the table that of 3,935 women, 3,196 had light and 739 dark eyes; and of 5,511 men, 4,199 had light and 1,312 dark eyes. Among the color-blind, the proportion of light to dark was 6 to 1, certainly a difference, but hardly one to draw conclusions from.

Niemetscheck's idea that the color-sense was in the frontal lobes of the brain, and that the forehead was narrow in the color-blind, is without foundation in fact, Holmgren's[8] and Cohn's[11] reports of the measurement between the pupils showing his mistake.

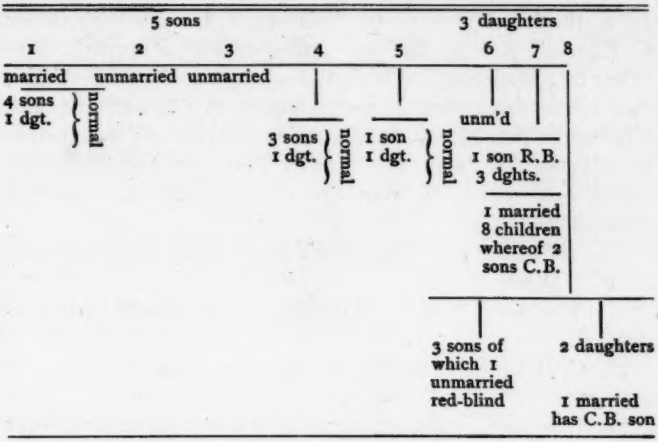
Color-blindness, being congenital, is hereditary, as all authors now agree, and as has been known, according to Holmgren, since the defect was observed. It has been recorded as coming to the male offspring through the mother. Jeffries mentions a case of Cunier's, where a lady was color-blind. Her mother and two sisters were the same. Her brother was free from the defect. The lady had six children—one son, not color-blind, and five daughters affected like herself. The oldest daughter had four children, two of them (girls) color-blind. The second daughter had a boy and a girl, the latter color-blind. Fourth daughter unmarried. The fifth left a boy myopic, but not color-blind.*

Heredity has been noticed by Wilson, Horner, Magnus, Cohn, Jeffries, Holmgren and some others. Magnus notes, further, that, according to Stilling, Szokalski, Seebeck and Rüte, the defect is inherited from the grandparents on the mother's side, which has recently been confirmed, and is, in fact, Horner's law. A normal-eyed man will have color-blind children by a woman whose father was defective. There are, of course, exceptions to the rule, but the author has seen three cases.

The following family register illustrates Horner's law of heredity:

* Quoted directly from Jeffries' Manual.

FATHER C. B.



Holmgren,[3] in 1877, published his results as to heredity. His experience was large, and he deduces the following:

1. Color-blindness is hereditary, and attached to certain families.

2. It may not be found in one generation, to reappear in the next.

3. All the children will not be affected, the girls especially escaping.

4. When several children are affected, it is traceable to the mother.

5. The kind and degree will be the same for all the cases in a family.

The author's notes on this point are not very accurate, as he found the lower classes either did not have or refused any information as to the defect among their relatives. He has trustworthy notes in reference to 34 cases out of his 217 C. B. This defect and blood relationship were positively *denied* in 27 cases.

In two cases the father had the defect similar in kind and degree.

In one case an only son was C. B., the daughter normal.

Three of the father's brothers were also C. B. In another case, grandparents, parents and children normal, but three of mother's brothers C. B. In another, the mother's father C. B., while parents, brothers and sisters were normal. Another had maternal uncle C. B. and maternal cousin C. B.; also a son of a maternal cousin was C. B. In another case, a maternal uncle C. B. and a maternal cousin and a maternal grandfather, as also the latter's younger brother. No blood relationship in marriage could be traced in any of these cases.

The following are the author's conclusions from examinations in Denmark:

1. The number of C. B. is 2.25 per cent. (both sexes together).
2. C. B. more common among men, 3.44 per cent. to 0.42 per cent.
3. It is more common among the lower classes, 3.89 per cent. to 3.09 per cent.*
4. It is equally distributed over the whole country.
5. Red-blindness is more common than green-, approximately 2 to 1.
6. The defect exists always in both eyes.
7. The color of the eye has no effect.

It must be finally said that the more numerous the examinations the smaller the per cent. found. The classification into red and green will be also affected. Cohn's recent tests in Breslau show this.

1.—MAGNUS. "Die Farbenblindheit, ihr Wesen und ihrer Bedeutung." Breslau, 1878, p. 41. "Beitrag zur Kenntnisse der phys. Farbenblindheit." *Græfe's Archiv*, xxii Bd., Heft 4.

2. *Beitrag zum Augustheft des Centralblatt. f. Augenheilk.* 1878.

3. "Om Färgblindheten i Sverig." *Upsala Läkare for förhandl.*, 1878, Bd. 13.

4. "Color-blindness, its Dangers and its Detection." Boston, 1879, p. 75.

5. *Op. cit.*, p. 2.

6. "Ein Beitrag zur Statistik der Farbenblindheit." *Centralblatt f. prak. Augenheilk.*, Dec., 1879, p. 360.

* By letter of date June 14, 1880, Dr. de Fontenay says: "My impression is that social condition has no effect on the proportion of C. B. Magnus thinks otherwise."

7. SEEBECK. *Poggendorff's Annal.* 1837, xlii, p. 177.
8. WILSON. "Researches in Colour-Blindness." Edinburgh, 1855.
9. DOR. "Nouvelle Recherches sur la Vision Chromatique." Lyon, 1878.
10. DAAE. *Norsk. Magz. f. Lagorid.* Bd. 7.
11. COHN. "Studien über angebor. Farbenblindheit." Breslau, 1879.
12. FAVRE. "Résumé des Memoires sur le Daltonisme." 1877.
13. WOLFE. "Colour-sight and Colour-blindness." London, 1879.
14. NIEMETSCHECK. *Prager Vietteljahrschr.* Jahr. 25, Bd. 4, pp. 224–238.
15. A. HANNOVER. Copenhagen, 1865.

EXPERIENCE OF A RED-BLIND PHYSICIAN WITH THE OPHTHALMOSCOPE PRACTICAL ADVANTAGE OF COLOR-BLINDNESS; WITH A CASE.

By Wm. S. LITTLE, A. M., M. D.,

CHIEF OF THE EYE CLINIC, JEFFERSON MEDICAL COLLEGE HOSPITAL.

WHILE color-blindness is being so thoroughly investigated as to its prevalence, disadvantages and dangers to society in general, I have to relate its close application to ophthalmology. We must not neglect to recognize the possibility of its existence being disadvantageous to ophthalmology as well as to other vocations in life. It has, however, its advantages also, as will be shown in this communication:

A physician, following my course of private instruction this winter, found difficulty in using the ophthalmoscope; while the other members of the class made the accustomed progress, he failed to do so. No disease of the eye existed, or refractive error to account for it; he mentioned he had trouble in recognizing colors, as other persons; a test revealed complete red-blindness.

His failures were with persons who were white, so I gave him a colored person to examine, whose eye-ground presents a grayish reflex, due to excess of pigment in the choroid, red being the reflex from white persons, varying in degree according to their general amount of pigment in other parts of the body. He saw the details of the fundus in the colored person without trouble; so he was supplied with persons of that complexion to study. Since, he has endeavored to recognize the normal fundus in white persons, according to his own standard, and states, it presents the following appearance: The reflex to him appears as the sky, blu-

ish; the papilla optica, or nerve, looks white, except where injected with excessive amount of blood, and he sees the vessels in it and upon it as dark lines; the darker being the veins, the lighter the arteries; he sees the white line running through each as is normal. He recognizes the variety of sizes the nerve presents, due to optical defects. In abnormal conditions of the eye-ground in white persons, due to diseased condition of the eye-ground, either in the choroid, retina, vitreous or lens, also the cornea with opacities he finds no trouble; in a case of morbus Brightii, very marked in both eyes, in a case of pigmentation of the retina, and a case of choroiditis disseminata, he described the conditions existing perfectly; only the red, to a normal-colored eye, appeared to him bluish; the abnormal condition same as to the normal-colored eye. In a case of marked kerato-iritis, with the cornea largely injected with blood, appearing very red, he failed to see the color, appearing only darker to him than the surrounding normal tissue. So, while he has to adopt his own standard for the normal fundus of a white person, except as to the nerve, he is able to recognize a colored person's eye-ground, same as any one without a color defect.

Looking through a yellow glass, at a white person's eye-ground, he sees better, and using indirect sunlight or daylight does better than in the dark room with gas-light; the red appearance being lessened to all observers.

Among my many students in the courses I have given, both while connected with Prof. Noyes' private courses in New York and my own in Philadelphia, I recall two or three who never could use the ophthalmoscope as others, and who had no disease of the eye or optical defect to prevent their doing so. These, no doubt, were color-blind, and were with me before the subject of color-blindness had been made so prominent or thoroughly ventilated. So color-blindness can have some practical connection with ophthalmology, both in relation to ophthalmoscopy and to the study of inflamed tissues in the eye; and while showing its disadvantages to others, bring ourselves into the same category.

Several color-blind have been found among the students of the Jefferson Medical College attending the present course of lectures, and I desire to obtain the experience of

a green-blind person with the ophthalmoscope, as well as a red-blind one, and will present the same when tested.

I know of no case related heretofore, connecting color-blind defect with ophthalmoscopy, and its description may be interesting to those investigating color-blindness,

Color-blindness has its advantages as well as disadvantages, which is illustrated by a case I recently examined.

In one of the largest publishing houses of Philadelphia, one of the firm requested me to test a gentleman in the establishment who had trouble with colors. I did so with the test that Wood & Co., of New York, have in their box of "Ophthalmic Tests" in general.*

The gentleman examined presented the condition of red-blindness. I told him that he would make a good engraver, when the member of the firm announced: "That is what he is so good at, and is our authority on the subject."

I merely narrate this case, as confirmatory of what is asserted, in an avocation being open to those that are color-blind, that is of value to art and a means of occupation, when they have selected one that color-blindness interferes with; and as the percentage of color-blindness is 4 per cent. for males, many are, no doubt, holding positions which interfere with their success in life; and youths, knowing they are color-blind, can adopt the engraver's art as a means of livelihood, and advance the art of engraving, which is so productive of pleasure to those who are not color-blind.

* I would state here that the tests given are not as correct as they should be. The first test, green, is not correct, being a yellowish green instead of a neutral green; then the test skein is too small, being one skein of worsted instead of several combined. The second test, to decide as to what kind of color-blindness exists (the first test being to decide whether a person is color-blind or not) is not the proper rose tint or magenta, being a lilac, and this test is not large enough, being only one skein. The third test, red, is correct enough; this test is confirmatory of the second one; this is also deficient in material. The remaining portion of the tests for all defects I do not criticise. As color-blindness is of the most importance to railroad employees and the marine service, no test should be used to decide them color-blind that is not as correct as possible. While an expert could use it for general adaptation, it might lead to error in some cases. This fault of the test can be readily overcome by taking Holmgren's test as the standard.

CONTRIBUTION TO THE STATISTICS OF MYOPIA.*

By Dr. O. JUST, of Zittau, Saxony.

Translated and condensed by H. Knapp.

THE extensive examinations of the eyes of school children made since 1866 by H. Cohn and many others, having demonstrated beyond a doubt that the school exerts a baneful influence in developing myopia, the object of future investigations can only be to ascertain whether the preventive sanitary measures introduced of late really have or have not diminished the frequency of myopia. I have, therefore, examined the eyes of 1,229 pupils of the two high-schools of Zittau, the one of which was erected in 1866, the other in 1871, and in both of which the hygienic conditions of light, space and arrangements of furniture leave nothing to be desired. The contrast between them and the dark rooms of our older schools is striking.

The examinations were made in the same room, under equable artificial illumination, both with glasses and the refraction ophthalmoscope, mostly without artificial mydriasis. Only those cases were entered as myopia which showed a decided improvement of visual acuteness by concave glasses, and whose myopia was verified with the ophthalmoscope. In some instances good S. could only be obtained by the aid of a concave glass, nevertheless there was no ophthalmoscopic myopia. These well known cases of spasm

* This paper appeared in the German edition in April, 1879.—K.

of accommodation represent, it seems to me, the transition from the hyperopic into the myopic refraction. I remember at least a few cases in which repeated atropia treatment each time produced a temporary good result, but did not prevent the development of permanent myopia.

As hyperopia are entered only those cases in which H. was manifest, for latent hyperopia was present in almost all eyes that functionally were emmetropic, a fact which, after the experience gained by Cohn at Schreiberhau, is by no means surprising.

The percentage of M. in the seven classes of our new high-schools was as follows:

25.7, 11.4, 22.2, 43.6, 45.0, 80.0, 58.8

which, leaving out of consideration the accidental inordinate figures in the first year and the sixth, agrees well with the results obtained by Cohn and other observers. *Myopia being as frequent in the new schools of Zittau as in other educational institutions of the same kind, we may fairly conclude that it does not chiefly result from insufficient illumination of the school-rooms, but rather from the great and ever increasing demands on the industry of the pupils at home, forcing prolonged labor on their eyes during the evening hours, frequently by insufficient artificial light.*

I am far from underrating the dangers of bad sanitary conditions in the school-rooms, but would urge the necessity to disencumber our children's eyes of as much evening work as possible.

Can *medical treatment* prevent the development of myopia, or check its progress?

The only remedy thus far recommended for that purpose is the instillation of atropia, but I think the majority of oculists claim for it only temporary results. When, after persistent use of the remedy, the myopia appeared more or less reduced, the previous condition in my cases returned very soon, and even the repetitions of this treatment during several years have not arrested the progress of the myopia. In future I think of pursuing a different course, viz., to give convex glasses for near work to all incipient myopes in whom, with the ophthalmoscope, I still find emmetropia

or low hyperopia. My object in so doing is to diminish the prolonged efforts of accommodation, which are generally believed to be the main cause of the development and progress of myopia. Later reëxaminations will show whether or not this plan may lead to good results.*

* We are afraid that convex glasses for near work will, in the majority of our young myopes only aggravate the injurious habit of holding objects nearer than the position of the far point of their distinct vision would require.—K.

THE APPLICATION OF ELECTROLYSIS IN OPHTHALMIC THERAPEUTICS.

By A. NIEDEN, M.D., of Bochum.

Translated by Isidor Furst, of New York.

(*With two wood-cuts.*)

THE ophthalmologist must be preëminently a conservative surgeon, inasmuch as the first aim, in operations upon the eye and its surroundings, is their performance without a loss of substance of the normal coverings.

Let us take, for instance, an angioma of the lids, which penetrates their entire thickness, reaches into the depth of the retro-orbital tissues, and has led to occlusion of the palpebral fissure and total uselessness of the eye; no surgeon would undertake to attack such a tissue with knife or scissors, because the only operation possible—removal of the entire lid and reconstruction of a new one—would fail on account of the deep-seated origin of the blood-vessels. Other methods, for instance the use of chemicals by the application of caustic substances, would not be more successful, on account of the size of the growth. Besides, after the sad experiences of Carter, Cripps, Santesson, and others, every careful therapeutist will desist from the subcutaneous injection of coagulating agents, owing to their dangerous character, especially with angiomata of the face.

Still, these tumors, which often increase rapidly, especially in infancy, require the quickest possible arrest of development.

Fortunately, thanks to the observations and experiments

first made in 1831 by Alphonse Guérard upon the equally inaccessible aneurisms of the larger blood-vessels, we have another mode of treatment in electrolysis.

Our text-books say but little of this method, barely a word or two being devoted to it, and there is no rich clinical material to draw upon. Still it will be worth while to call the attention of ophthalmologists again to it, on the strength of the essentially practical interest offered by the application of the constant currrent to this form of tumors. As every ophthalmologist must be in possession of a constant battery for the treatment of affections of the eye, the employment of this form of electricity will be easy, simple, and quickly learned, while its applicability is more comprehensive than would appear at the first glance.

I shall at once enter *in medias res* by the communication of some practical results attained by this method, and then discuss briefly the details of the treatment.

On August 2, 1879, Nolte, a miner, consulted me on account of a tumor on the upper lid of the left eye. He stated that it had existed from his infancy in the shape of a protuberance on the upper lid, about the size of a hazel-nut, and did not interfere with the use of eye. Only for about a year the patient noticed a slow but steady growth of the tumor, dating from a blow received across the eye while at work, which, however, did not produce any visual disturbance. During the last six months it had grown so large that the lid could no longer be opened, and since then the increase in size and circumference had been still more rapid. Particularly when stooping or on forcible straining, he had noticed a further swelling and disagreeable feeling of heat in the tumor.

FIG. 1.

There had never been any pain, and the patient had only been disturbed in his vocation by being confined to the use of the right eye.

Patient is a robust, vigorous man, aged 61 years. At the first glance, we see a prominent swelling of the left upper lid, covered with the normal integument, and considerably overlapping the lower lid. The tumor is the size of a large pigeon's egg, is of dark, bluish-red color, and appears to be superficially divided by a raphe into two parts, the lower of which projects more hemispherically. Patient is unable to lift the lid spontaneously, although the contraction of the different fascicles of the orbicularis can be well noted. On palpation, the tumor has a soft and doughy feel, is easily compressible, and evidently composed of large blood-vessels into which the blood returns quickly and rhythmically as soon as the pressure is released. The vessels can be traced into the retro-orbital cellular tissue when the pressure is prolonged and penetrating. The two slightly separated parts of the swelling communicate directly. During straining and coughing, the tumor appeared tenser and more livid; pulsation, however, was not noticeable, nor could any effect be perceived from pressure upon the left or upon both carotids. After continued pressure, the upper lid could be raised sufficiently to show the quite intact globe which had normal vision. From this condition the statement of the patient appeared probable, that although the origin of the tumor dated from infancy, yet the sight of the eye had not suffered until recently.

The case, therefore, was one of teleangiectatic angioma which had developed between the coverings of the lid; it was composed largely of thick venous trunks, and thus may be more strictly designated as a varicose tumor. Patient urgently desired to be freed from this tumor; in the first place, because for the last few months it had steadily and alarmingly increased; in the second place, because he had been deprived of the habitual use of the left eye and therefore of stereoscopic vision, thus seriously interfering with his work. Moreover, in the at times rather dangerous occupation of the patient, I could not hide from myself that, under certain conditions, an injury to the much dilated blood-vessels might directly endanger his life. But what could therapeutics do under such conditions? As the

tumor was in direct, most intimate connection with the palpebral tissues, and at the same time extended without limitation into the depth of the orbit, an enucleation was impossible without total loss of the lid. Digital compression was not capable of entirely shutting off the supply without endangering the globe. Ligation of the afferent and efferent vessels was impossible where they were thus deep-seated. Injections of sesquichloride of iron could not be employed, for well-known reasons, particularly the probable, ample, indirect communication with the cavernous sinus; nor could we, under the circumstances, think of ligature *en masse*. Therefore, as a last resort, I determined on electrolytic treatment.

Patient was admitted to the hospital, and during the first sitting I introduced the two needles of the positive and negative currents into the midst of the tumor, to a depth of about 1½ *cm.*, employing six elements. The action of the current was quickly manifested by a large number of small gas bubbles escaping at the negative pole, accompanied by discoloration of the tissue directly around the punctures at both poles. The neighborhood of the positive pole appeared more deeply colored, was more drawn in, and no development of gas was visible near the needle. After the current had passed through the tumor in this direction for about one and a half minutes, I withdrew the needle of the negative pole from the puncture without resistance, and inserted it anew at a more distant point. The same appearances, as described above, immediately showed themselves in the neighborhood of the electrodes; besides, after a brief action, the place between the two needles in the tumor felt harder and more consistent. After I had changed the negative needle several more times, and had operated altogether about ten minutes, I removed them, experiencing considerable resistance from the positive needle which was held back by a firm substance resembling gangrenous tissue. Hemorrhage did not ensue from any of the punctures. The surface of the negative steel needle was bright and smooth, while that of the positive pole appeared exfoliated, rough and black. During the procedure, particularly at every opening and closing of the circuit, patient complained of some pain, but was not troubled with any cerebral symptoms, as vertigo, nausea, etc., nor with any entoptical manifestations of retinal irritation.

Immediately after, the tumor felt somewhat warmer to the touch, had a decidedly firmer consistence, and was less compressible.

The entire surface was then washed with disinfecting fluid; the few gas bubbles remaining in the punctures of the negative pole were expelled by subsequent slight compression, and the whole surface hermetically covered with carbolized cotton. The pain had ceased with the termination of the operative procedure.

This operation was repeated in the same manner on the third day after; the needle punctures had dry scabs; the tumor had increased in firmness, especially in their neighborhood, and was not painful on pressure.

During the second sitting the same phenomena were observed; duration, ten minutes. The negative pole only was withdrawn and reintroduced, because in this manner the procedure is accomplished without loss of blood, while during frequent extraction of the positive needle, even with the most careful manipulation, blood flowed from the punctures.

After the third sitting on the eighth day, it appeared that some of the punctures or their surroundings had not formed a dry, gangrenous scab, but that suppuration had developed in them; besides, several slightly suppurating fistules, which communicated in the centre of the tumor, could be demonstrated.

After the fourth sitting, during which the introduction of the needles had been confined chiefly to the intermarginal border, it was observed on the following day that the circulation in the tumor had completely stopped, and that a further compression was, therefore, no longer possible. The mass had a firm feel, and from the various punctures laudable pus issued copiously. An attempt to evert the upper lid showed the surprising phenomenon that the upper palpebral integument spontaneously separated from the conjunctival part, so that from its edge the lid could be completely split into two parts. Between these was a brownish-black gangrenous mass which could be easily detached by the forceps, and which proved both macroscopically and microscopically a convolution of degenerated walls of blood-vessels. This product of degeneration could be removed as a long filamentous mass between the palpebral integuments even beyond the supra-orbital margin, when the two raw surfaces of the epidermic and conjunctival layers were seen to be covered with healthy granulations.

Therefore, the varicose tumor, by means of the electrolytic pro-

cess—probably through preceding thrombosis in the larger afferent vessels—had been completely separated from its annexa in the palpebral connective tissue and had been cast off.

Thenceforth I had only to take care, by employing gentle pressure, that the two granulating surfaces should effect a regular union. The removal of some isolated teleangiectatic prominences in the epidermis of the upper palpebral margin had to be postponed until after complete cicatrization.

The two granulating surfaces united so rapidly that in a week the upper lid had shortened so much that the upper margin of the lid, which heretofore had considerably overlapped the lower one, was again in its normal position, and a slight lifting of the lid sufficed to expose the globe.

It now became evident that the teleangiectatic proliferation had not confined itself to the upper lid, but that a red welt-like ridge in the bulbar conjunctiva extended from the upper transition fold toward the corneal margin, forming a teleangiectatic tumor of the conjunctiva, about the size of a pea. Otherwise the globe was normal, and vision intact.

After the lapse of another week, the palpebral surfaces had completely united as far as the intermarginal border, the lid could be opened spontaneously, and only a few varicose protuberances at the external margin of the upper lid presented a rather rugged appearance, and prevented the opening of the lids to the same extent as on the other normal side.

By a fifth sitting, lasting but five minutes, and with the use of only four elements, these small excrescences were likewise made to disappear. Since the needles had now to be inserted into partly new-formed cicatricial tissue, it was found that the electrolytic decomposition proceeded so much more quickly and intensely that the needles had to be changed rapidly, the duration of even half a minute threatening too extensive a destruction. The elevations disappeared, the palpebral fissure soon assumed a normal size and form, and nothing re-

FIG. 2.

mained to be done at a short sixth sitting but to remove a few small varicose patches, the size of a pin's head, found scattered on the surface of the lid, and the patient could be discharged cured after about one month's treatment, in the condition depicted in the second engraving (after a photograph), with a sufficiently wide palpebral fissure to permit the free use of the eye, and with a but slightly thicker upper lid. The teleangiectatic proliferation in the conjunctiva had not extended. I therefore abstained from a further electrolytic treatment of this new-formation ; first, because I was afraid to introduce the electrodes, even with a current of but four cells, directly into the bulbar conjunctiva, which possibly might produce an injurious irritation of the retinal elements ; secondly, because, in an eventual extension of these varicosities, I could undoubtedly cause them to disappear just as certainly and rapidly by a simple ligation of the entire plexus at the transition fold.

Up to date, the cicatricial tissue of the upper lid has contracted so far that the upper lid of the left eye scarcely appears to differ from that of the other side in form, thickness and color. The cicatrices of the different punctures are barely visible, and are partly hidden in the folds of the lid. Patient is in no way hindered in the opening and closing of the lids, and has the free use of his eye.

A similar case, but in the initial stage of development, came under my treatment a few weeks subsequently. It was an angioma in a child aged ten weeks.

For about five weeks the parents had noticed a projection of the outer part of the upper lid of the left eye, which, during one week, had visibly increased in size. Particularly when the child cried this portion bulged considerably and assumed a bluish tinge. After the lapse of a few weeks the tumor had already grown so large that the lid appeared quite disfigured by the projection, which at this time extended beyond the middle of the upper lid, and had induced the parents to seek medical aid.

The child was healthy and well developed. I found an even projection, about the size of a hazel-nut, of the left upper lid, covered with the ordinary integument ; it extended from the external superciliary margin beyond the middle of the lid. The palpebral fissure was diminished by the consequent hanging down

of the upper lid; the surface of the tumor disclosed some slightly ectatic vessels. When the child cried and held its breath, the tumor swelled rapidly to the size of a walnut, became livid, and showed the superficial vessels to be the size of a raven's quill.

Pressure upon the tumor reduced it easily, and made the skin over it wrinkle. It could be felt that the tumor was nourished by a plexus of vessels proceeding from the deeper parts of the orbital cavity. Pulsation and thrill could not be made out. The globe was intact. In this case, too, from the above-named reasons, for the urgent necessity of therapeutical interference, I had to determine on electrolysis as the only feasible treatment. On account of the delicacy of the infantile tissues, a very slow and cautious procedure was indicated; therefore, I commenced the application of the needles with a current from four cells. The needles were introduced as in the former case, both simultaneously, into the midst of the tumor, the circuit being closed each time for half a minute. The negative needle was then withdrawn and reintroduced at a more distant spot. The duration of the sitting was about four minutes, during which, therefore, eight punctures were made. The phenomena were exactly like those above described; the inflammatory reaction was very slight. Two sittings were held every week, and after three weeks it could be distinctly seen that the growth of the tumor had been arrested, that it gradually became firmer to the touch, and that it did not project as much when the child was straining and crying. After six weeks, following a more prolonged application with six cells, an extensive purulent degeneration ensued in some of the communicating punctures, the resulting cicatrization of which, however, was but favorable to the further retrograde metamorphosis of the tumor. At present, after twenty sittings, the angioma has disappeared, barring a slight projection of the skin at the outer end of the superciliary margin; the integument is normal, like that of the other eye; several dark-colored patches indicate the cicatrices of the gangrenous punctures; the child raises and lowers the lid quite freely, and probably one or two sittings will suffice to cause the last remnant of a proliferating neoplasm, which endangered the use of the eye, to disappear without leaving a trace.

Hemorrhage ensued only a few times in the shape of some drops from the punctures, and was generally arrested by the introduction of the needle into the imme-

diately adjoining tissue. Even the occasionally ample development of gas in the tumor during the application of the needles, causing the hydrogen to escape bubbling from the various punctures, never had injurious consequences, as was feared by Billroth. It need hardly be mentioned that I proceeded in a strictly antiseptic manner in the after-treatment at the close of every sitting.

In a third case I obtained a favorable result more rapidly:

In July, 1877, a one-year-old child was brought to me, which, shortly after birth, was affected with a slight protuberance at the inner side of the upper eyelid. It was the size of a lentil, and had the color of the palpebral integument. At first no regard was had to the tumor. When, however, it was noticed, after some weeks, that it increased in size, a physician was consulted who stated the case to be one of fungus hæmatodes, for which nothing could be done in that situation and while of that size. The parents were reassured by this opinion, although the tumor increased more and more during the following months. Not until the child's eye was closed by the progressive proliferation did the parents feel constrained to seek other aid.

I found, in a healthy and well-developed girl, complete closure of the left eye by a tumor situated in the upper lid. Further examination showed that it sprang from the portion of the lid next to the nasal bone, that it felt soft on palpation, was covered by the normal integument, had the size of a nutmeg, and reached as far as the middle of the lid. It could be completely reduced by even pressure, leaving a strongly-wrinkled redundance of skin; while, on relaxing the pressure, the former size of the tumor was quickly restored without perceptible pulsation. Pressure was not painful; pulsation and thrill were not present in the tumor.

After emptying the tumor, the upper lid could be lifted, showing the eyeball quite normal, only somewhat limited in its mobility toward the right side. In this case, as in the others, excision was not to be thought of, continued compression did not promise to be effective, either generally or with this small individual particularly, and electrolysis was chosen as the curative agent. I employed from four to six cells, used both poles, armed with steel needles, subcutaneously, and operated on the following day for a space of three minutes.

After a week, the upper parts of the tumor felt more tense and firm, the base alone being still compressible. All the needle punctures had dry scabs. In the second week I introduced the needles more deeply, as far as the bone, but left the negative needle in it only until a brisk development of gas was noticed in the punctures. The scabs around the positive needle, which remained during the entire sitting, assumed a more intensely black color, owing to the increased oxidation of the steel surface of the needle. In consequence thereof, the needle opposed a greater resistance to the withdrawal, and small hemorrhages were more frequent. As some of the punctures commenced to suppurate in the third week, the sittings were discontinued for a time, all the more because the tumor had already decreased sufficiently to enable the child to slightly open its eye again spontaneously. Three additional sittings in the fourth week sufficed to cause the entire disappearance of the tumor, and thus to complete the cure in four weeks.

By a further cicatricial contraction of the tissues, the configuration of the upper lid was completely restored in the course of the following month, so that the palpebral fissure could be opened exactly like the right one, and the form of the lid had become normal.

Two years subsequently, I had again the opportunity of convincing myself how completely the tumor had disappeared; some of the punctures, which had suppurated more copiously, in the shape of whitish, small, punctiform cicatrices, being the only evidences of the operation. Form, position and mobility of the upper lid showed no abnormity.

The fourth case was that of a child of fifteen months which at birth had a small red nævus maternus, the size of a pin's head, on the middle of the left upper lid, near the margin.

At first the mark retained its size, so that the parents did not feel called upon to seek medical aid. When, however, after six months the growth increased, a physician was called in who cauterized it with fuming nitric acid. This treatment was not effective; the skin was cicatrized superficially, but the tumor underneath grew all the more quickly. When I saw the child, the teleangiectasia had assumed the size and shape of a thick mul-

berry, was covered with a delicate, white cicatricial skin, was of a dark-red color, and was situated in the middle of the lid, extending from the lower border almost to the superciliary margin. The weight of the tumor caused the upper lid to droop; the lower part of the cornea only was visible in the palpebral fissure. When the child held its breath, the tumor rapidly increased in size, became livid, and the eye could no longer be opened. The tumor could easily be made to disappear by compression, and when the lid was then everted it was seen that the whole parenchyma of the lid was penetrated by it; the corresponding portion of the conjunctival surface had a dark-violet color, and ectatic vessels came plainly to the surface.

The electrolytic treatment—bipolar, with five cells—which was instituted at the polyclinic, could be carried out in rapidly succeeding sittings, because in this case the favorable and relatively very rare result was obtained that a thrombosis or dry gangrene ensued around the needles, and that, consequently, a quick shrinkage of the entire tissue of the tumor was secured after about twenty-eight or thirty needle punctures in six sittings.

The tumor shrank, the gangrenous parts of the punctures of the negative pole were cast off, loss of substance in the continuity of the lid did not occur, and in two weeks the lid showed normal conditions in shape and appearance.

This is the only case under my observation, in which an angioma of such an extent disappeared by dry scabbing and coagulation, while this process may be looked upon as the constant result of the electrolytic treatment in the flat teleangiectasias situated in the superficial layers of the skin, which are frequently observed in the cutis of the lids as small disfiguring spots. In larger vascular tumors with vessels of medium size, the healing process is generally a purulent degeneration of circumscribed portions of the tissue around the needles, and subsequent cicatricial contraction.

The destruction of atheromatous cysts, fibrous and epithelial tumors, and lupus, may exceptionally be done by electrolysis; but, as a rule, they can be better, more quickly and more conveniently removed with the knife or the sharp scraping spoon.

I shall now proceed to a brief description of my method of employing electrolysis. I use a portable constant apparatus made by Krüger, of Berlin, after the model of Spamer. After having immersed the first row of ten elements and closed the circuit, I convince myself by the galvanometer that the current is passing, and note its direction, so as to know which needle is connected with the positive and which one with the negative pole. If the physician is not in possession of an apparatus provided with a galvanometer, he may employ a small quantity of an ointment of potassium iodide with glycerinum amylatum, into which the needles are dipped not far apart, after the circuit is closed. As soon as the current is passing, the positive electrode will manifest itself by a bluish discoloration around the respective needle, because the positive electricity liberates the iodine in the ointment, which, by combining with the starch contained therein, gives to the surroundings of the positive needle the bluish-black tinge, while around the negative needle there is no change in color.

Although the kind of metal in the needles is immaterial, as regards the effect, still the employment of steel needles as positive electrodes has the disagreeable feature that, through the rapid oxidation of the metal, a considerable corrosion of the surface of the needle is effected. It becomes rough; after having remained in the puncture for some minutes, it can be removed only with some degree of force, and will seldom be drawn out without some slight hemorrhage. Moreover, the neighborhood of the positive steel needle is rapidly discolored by the intermingling of the products of oxidation with the adjoining tissues—a fact which should be borne in mind in the removal of angiomata of the face, since this dark pigmentation, after the dry gangrene, remains.

Even gold needles oxidize too quickly, lose their point, etc., so that for bipolar electrolysis the use of a platinum needle for the positive pole is the most desirable; while for the negative electrode, steel, gold or platinum is equally serviceable. As I always employ bipolar percutaneous electrolysis, I introduce first the needle of the positive pole

into the tumor. If the negative needle were first introduced, the circuit would be closed with the touch of the point of the positive needle, and with this the chemico-physical action on the needle would begin directly, causing changes on its surface which would prevent the easy introduction into the depth of the tumor. This precaution may be dispensed with only with platinum needles. The needles are inserted at the places appearing most desirable for the first attack; in smaller tumors, one for each pole; in larger ones, two or more for the negative pole.

As soon as the connection is made, white gas bubbles may be observed to form in the neighborhood of the negative pole, close to the needle, often with an audible crackling, and to well out from the puncture. After the needles have remained *in situ* for one or one and a half minutes, according to the density of the tumor, and the negative needle feels loose in its puncture, it is removed in order to reintroduce it into the tumor at some more distant point. This procedure is repeated several times, according to the reaction, pain, and amount of effect, while one finger at the same time exerts a slight pressure upon the tumor, so as to express some possibly retained air—or hydrogen—bubbles from the punctures. In accordance with my experience, I must disagree with v. Bruns* as regards the correctness of his deductions, when in his text-book he decidedly dissuades from introducing the negative needle into angiomata, "because a copious development of air (hydrogen) at once occurs in the blood, from which great immediate danger is to be feared." I, too, can report quite a number of personal observations of angiomata, in even the largest of which both poles had always been introduced, yet I have never seen any injurious effect from the development of gas in the tumor. My experience shows that if gases should collect under the skin and undermine the tissue, they can be removed through the open punctures by the slightest pressure, thus justifying the assumption that the gases never penetrate into the blood or the blood-ves-

*Von Bruns: "Handbuch der chirurgischen Praxis." Tübingen, 1873, Bd. I, p. 687.

sels, but collect only in the interstitial tissue of the tumors. In an angioma, the size of a goose-egg, with blood-vessels as large as a swan's quill, which had been growing for several years, in which many deep-seated deposits of phleboliths could be felt, and which likewise was treated by bipolar electrolysis, I never saw any injurious effect, despite a great temporary bulging of the tumor by the developing gas bubbles during the operation, from the brief existence of this collection of hydrogen.

My view corresponds with that of the electrotherapeutist Althaus,* who also advises to introduce only the negative needle into angiomata, and, from my observations, I am led to believe that Billroth, of whom v. Bruns† reports that he had feared dangerous accidents from the continuation of the operation in a similar case by the rapid bulging of the tumor after the introduction of the negative needle, was afraid of a danger which really did not exist.

Immediately after the electrolytic cauterization, the skin is washed with a disinfectant solution, the tumor is again cautiously compressed, and covered with a disinfecting bandage. According to the degree of inflammation, cold, in the shape of wet compresses, is applied; or, for the more rapid elimination of the detached tissues, cataplasms are applied on the following day. On the second or third day, the sitting is repeated. Should numerous suppurating fistulas occur in the tissue, in consequence of the repeated introduction of the needles, the sittings are interrupted, to await the effect of the processes of healing and cicatrization.

In these cases I have always observed a more rapid cicatricial contraction than is generally seen in other suppurating and granulating wounds. Should we, in spite of suppuration and formation of granulations, let one sitting follow another, the remark of v. Bruns‡ would be justified, that "cauterization by means of electricity represents in general a very mild and harmless method; but by its incautious

* J. Althaus: "A Treatise on Medical Electricity." London: Longmans & Co., 1873, p. 361.

† Von Bruns, l. c., p. 643.

‡ L. c., p. 667.

application extensive destruction, with the possible consequences of frequent inflammations, pyæmic and septicæmic processes, may be the result."

Caution and *rational* application of any surgical procedure should, however, be taken for granted with every one who expects to cure diseases.

Despite extensive and manifold application of the electrolytic current, with due regard to the necessary number of elements according to the locality—the head or the organs more distant from the centre—and with the succeeding careful surgical after-treatment of the wounds, I have never had occasion to observe a single ill effect from this method. The greatest number of my observations were made on children, often in the first weeks of life. With such delicate tissues, mostly four elements sufficed, with closure of the circuit for one minute at a time, to produce ample cauterization. It must also be borne in mind that, in the succeeding sittings, when operating on a partly new-formed cicatricial tissue, short sessions even may lead to extensive loss of substance; for these parts I prefer the application of the unipolar percutaneous electrolysis, according to the kind of tissue to be destroyed, either of the positive or negative pole, while the second electrode is applied to the skin in the neighborhood of the tumor, in the shape of the sponge-electrode or a metal plate.

In recapitulating the advantages derived from the different modes of application of the electrolytic current, we find, with reference to its coagulating and caustic effect, that they consist in: 1st. Its applicability for the removal of neoplasms where other means fail or are of too uncertain and dangerous a nature. 2d. Tumors, cavernomata, angiomata, and teleangiectatic tumors may be destroyed without entailing a loss of substance of the normal coverings. 3d. The extent, the effect sought to be attained, may be accurately determined by the number of the needles introduced, the number of the cells, the duration of the application, and the strength of the electric current. 4th. We may operate almost without any loss of blood, by employing some degree of care in withdrawing the platinum

needles, and, moreover, the pain is generally very moderate. 5th. The application is easily learned and quite free from danger; it alarms the patient less, on account of the simplicity of its manipulation, than other surgical procedures.

Finally, regarding the employment of the constant current as an alterative remedy which induces absorption—in which quality it may likewise be looked upon as electrolytic—it has been recommended mainly for the clearing up of corneal opacities, absorption of iritic membranes, etc. Quadri of Naples, Türk, Willebrand of Helsingförs, v. Gräfe, Meyer and Chvostuk, claim to have secured quick and important results in the above-named affections, by applying the negative pole to the closed eye and the positive pole to the hand or mouth, and by galvanization of the sympathetic nerve.

My observations did not furnish the favorable results reported by these authors. I could demonstrate neither a quicker nor a more perfect clearing up of corneal opacities, no matter in what form the currents—necessarily very weak in these cases—were applied.

Neither can I concur with the observations of v. Gräfe,* who was able to effect the quick absorption of a cataract by the application of the constant current.

At any rate, for such cases other means are at our disposal, which, with even simpler mode of application, lead to at least equally rapid and good results, although the possibility of an absorbent effect must be conceded to the current.

* *Deutsche Klinik*, 1852, p. 445.

RETRO-BULBAR HEMORRHAGE.

By STEPHEN C. AYRES, M.D., Cincinnati.

Case 1.—Mrs. J. W., a delicate-looking woman, 56 years of age, came under observation December 9, 1875, with the following history: She says that the left eye is entirely blind, and has been so for about one year. She suffers no pain in it now, nor has it ever given her much pain since it began to fail. She paid but little attention to it as the right eye remained good until ten days ago. At that time she noticed a mist forming before it which has gradually deepened, until now her sight is very imperfect.

Status præsens—Left eye: Has absolute glaucoma; V=O; media clear, with the exception of the periphery of the lens which is becoming opaque. There is a deep excavation with bluish atrophy of the disc, but there is no pulsation of the central artery. $+T_2$.

Right eye: Acute glaucoma; media turbid; $+T_1$. Cannot see fundus distinctly; pupil moderately dilated, but responds sluggishly to light; V=fingers at 6′.

The next day an iridectomy under ether was made on both eyes. The operation on the left eye was made to prevent subsequent pain, which it was feared might compromise the result on the right eye. No reaction followed. The incisions healed kindly and ten days afterward V=$\frac{20}{30}$ *R. E.*, and she was able to read Sn 1 at 12″ with + 20 Sph. The media were perfectly clear and there was no excavation of the disc nor any atrophy. The tension in both balls was normal. She was now allowed to return home, and was not seen again until April 6, 1876, when her vision was as good as when discharged after the iridectomy.

Everything went on well now, her vision remaining good, and nothing unfavorable was heard from her till January 12, 1878, when she again presented herself for treatment with the following interesting history:

She states that her sight was as good as usual until January 9th. On the night of that day she went to bed as usual, but about ten o'clock was aroused with pain in the right eye. She got up and rubbed her forehead with spirits of camphor and took two compound cathartic pills.

About twelve o'clock she commenced vomiting, and continued to do so about every half hour until next morning. She then noticed a swelling or puffiness of the eyelids which increased during attacks of vomiting.

About ten o'clock the vision of the right eye began to fail so rapidly that in a few minutes all perception of light was gone.

Her condition to-day (12th) is as follows: The eye is very exophthalmic. The orbital tissue as well as the eyelids are filled with extravasated blood. The conjunctiva is elevated around the cornea like a ring, and feels tense and hard from the infiltration of blood into it. The great prominence of the eye and the striking discoloration of the conjunctiva and the lids, give her a very peculiar appearance. Motions of the eye outward and downward are limited. The tension of the eye was not increased. Examined ophthalmoscopically the eye presented no remarkable changes. The veins were apparently engorged and more tortuous than natural, but there were no extravasations into the retina or choroid. There was blanching but no excavation of the disc, and no pulsation of the central artery. Auscultation and palpation of the closed lids revealed no bruit or impulse.

She had had no cerebral symptoms previous to the attack of vomiting after taking the pills, nor had there been any indications of existing aneurism of the orbit.

Previous to her first visit in 1875, she says that for years she had had occasional attacks of nausea and sometimes vomiting.

The exophthalmos gradually subsided in the course of two or three weeks, and the movements of the ocular muscles were regained. Vision, however, never improved, and she remained absolutely blind.

Case 2.—For report of which I am indebted to Dr. Robert Sattler.

Volkman, æt 49, laborer. A few days ago, while at work shoveling coal out of a barge, noticed a feeling of discomfort in his left eye, which was soon converted into pain. At the same time he noticed some prominence of the eye. In the course of half an

hour the eyeball became so prominent and the eyelids so tense that he was unable to open them. Separating the lids he found vision intact.

The pain subsided in the course of several hours, but the feeling of fulness, together with the inability to open the lids, persisted, and three days after the onset of his trouble the following condition was found: Exophthalmos of about 5″; lids tense and closed. No trace of œdema or ecchymosis. On opening the lids, the eyeball was found remarkably exophthalmic, but free from all injection or abnormal appearance. The ophthalmoscope shows the refractive media clear, and retina and optic-nerve entrance normal. The excursions of the globe are almost abolished, yet a limited motion exists outward and inward. There was no history in this case of a blow or injury, except the muscular efforts resorted to while shoveling. He had suffered from a bronchial affection, but had never had violent paroxysms of coughing. There was no history of rheumatism or atheromatous alteration of the arteries. In this case the diagnosis of orbital hemorrhage was made by exclusion, and the further progress of the case sufficiently established it.

With rest, a compress bandage, occasional use of cathartics, the symptoms subsided and the exophthalmos disappeared. Gradually the excursions of the globe were regained as well as the movements of the lids, and in three weeks the eye was in a normal condition in every respect. The vision had never been impaired.

The physical condition of the two patients mentioned above was as dissimilar as could be imagined. One a delicate woman in the decline of life, and the other a vigorous, powerful man in excellent health. Mrs. W. complained of pain in the eye after going to bed, but it seems quite probable that the hemorrhage did not take place until after vomiting began. Her sight did not fail until the next day. As she is a woman of intelligence, and had had previous trouble with her eyes, we can accept her statement as to the rapid failure of vision. It would seem that the clot in the orbit increased after each attack of vomiting, and finally the optic nerve was so stretched that its function was abolished.

In Volkman's case the hemorrhage occurred while he was at work, and as coal-heaving requires strong

muscular efforts we may conclude that they were the factors in his case. The exophthalmos was not so great as in Mrs. W.'s case, and, having had no previous trouble with the eye, was not followed by such disastrous results. It seems reasonable to think that a further continuance at his work would have increased the hemorrhage, but as he desisted, it was arrested short of the point of doing him any serious damage. In Mrs. W.'s case the vomiting continued for several hours, and at each recurrence the exophthalmos increased.

INVESTIGATIONS ON CANCER OF THE LIDS.

FROM PROF. J. HIRSCHBERG'S CLINIC, MADE UNDER THE AUSPICES OF DR. C. FRIEDLÄNDER.

BY DR. OTMAR PURTSCHER.

Translated by WILLIAM C. AYRES, M.D., of New York.

(*Plate* I, *Figs.* 1–7.)

CASE 1.—Mr. Kasserow, 70 years of age, presented himself in Prof. Hirschberg's clinic April 19, 1880, on account of his left eye. The history of the case was only that he had noticed a thickening of the under lid for about six months.

When first seen, the lid was considerably thickened, but the skin normal. The lid margin stood about 1 *mm.* away from the globe, and tears accumulated between them. When the lid is drawn downward a tumor is seen which has a diameter of about 1 *cm.* It is covered by the conjunctiva of the lids, runs toward the inner canthus, and is soft. It continues on to the caruncle, which is, however, not much enlarged, and on its surface are several small points of a dirty white color. From the caruncle toward the corneal margin, there is a thickening of the conjunctiva resembling a pterygium, about 1 *cm.* in breadth. There is an ulceration on the thickening the size of the lentil, extending nearly over the entire inner and inferior third of the cornea. Its limits are not sharply defined. The ulcerous part has a lardaceous reflex, is uneven, and sometimes rises above the level of the cornea. S. Left $\frac{15}{200}$. + 6 D = Sn. 2½ with difficulty. Right $\frac{15}{200}$; with + 2 D. Sn. LXX. + 4 D. Sn. 2.

No intra-ocular changes nor defects of motion. Lues could not be made out, but by the wish of the patient he was treated with inunctions of mercury.

The tumor was diagnosticated a carcinoma, and the operation was done, under narcosis, the 8th of May. The canthus externus

was widened, and an incision made from the inner canthus downward, so that the under lid could be conveniently everted and the tumor easily detached from the conjunctiva. It was feared from the beginning that the globe would have to be removed, and this proved to be the case, for as soon as the skin was detached it was seen that the tumor continued down on to the inner inferior octant of the sclera and was firmly attached to it. The whole conjunctiva of the under lid and the caruncle was also cut away, leaving only the conj. tars. sup., which was the only normal part.

Healing rapid. Beginning of June, 1880, *status bonus*. I had the opportunity of seeing the case from the beginning to the end.

A section through the tumor shows a cavity in its centre; its limits irregular and generally nodular. In this space was a mass which was colored red by eosin, and the cavity communicated with the conjunctival surface of the tumor by a small opening the size of a pin's head.

The walls of this cavity and the greater part of the tumor show a perfect carcinomatous structure (see plate 1, fig. 5), viz., a large number of anastomosing epithelial cylinders, embedded in a stroma rich in round cells.

There is not a trace of the lid cartilage left and only small parts of the lid muscle.

A section through the continuation of the tumor on to the sclera gave also carcinomatous structure. The cylinders are made up of polygonal cells like the epithelium of the cornea, except that they are not so regular in shape.

The section also passed through the m. obliq. inferior, which was firmly attached to the tumor, and where they meet we find a larger quantity of granulating tissue. Epithelial cylinders run between the bundles of muscle-fibres and into a tissue made up of round cells which sometimes pushed the bundles wide apart. (Fig. 2.)

There is consequently a high degree of atrophy of the muscle fibres which are frequently only one quarter of their natural size.

The tumor is also firmly attached to the sclera. The episclera is densely infiltrated with round cells, but contains

no carcinomatous cylinders. With the exception of a slight infiltration in the outer layers, there is nothing abnormal in the sclera.

In a meridional section through the anterior part of the eye, in the region of the tumor, the cornea is sometimes reduced to about $\frac{1}{8}$ of its thickness, but where the abnormal tissue passes on to it, it is frequently three times as thick as its normal state. This increase is due principally to granulation tissue, but in it we also find irregular proliferations of the corneal and conjunctival epithelium, which sometimes go deep into these tissues, and produce an alveolar anastomosing network. (See plate.)

In the region of the granulation tissue, the outer layers of the cornea are split up, and between its fibres are numerous round cells, the number of which diminish as we go toward the normal cornea. Round cells are also found between the cornea and the membrane of Descemet. The membrane of Bowman is distinguished in a large area, and lies with its ends projecting into the granulation mass. Sometimes the mass passes beneath it. The corneal epithelium comes from above in large tracts and irregular forms; that of the conjunctiva from the outer side, and extends almost to the inner side of the ulcer. (See plate.)

This is an example of an ulcer which is covered with epithelium, but cannot be said to be in a stage of healing, as pointed out by C. Friedländer* and Jakobson. Glands are found in the conjunctiva bulbi 3–4 *mm.* from the corneal margin, as described by Berlin, Iwanoff, and Jakobson, Jr. They communicate with the surface of the conjunctiva as complex and sometimes as simple tubular glands. They are distinguished by long cylindrical cells, which cover their walls, lying only one layer deep.

The caruncle also shows carcinomatous formations.

Case 2.—Frau Hahn was admitted February 11th on account of a carcinoma in the left inner corner of her eye, which had extended to the globe and had exposed the septum narium. There was also a small carcinomatous ulcer in the outer corner of the

* "Ueber Epithelwucherung und Krebs." Strassburg, 1877.

eye, which had nodes in its interior, and which had attached itself to the bone. On account of the extent of the complication, the patient was sent by Prof. Hirschberg to Prof. Langenbeck's clinic.

Prof. Langenbeck removed the globe and the contents of the orbit, with the periosteum and the lids; also the inner inferior wall of the orbit and a few tumors which had made their way into the nasal passages were cut away, and the operation ended by closing the orbit with a flap from the cheek.

After two days the patient died.

On examination, the tumor was found to be a carcinoma with hyaline degeneration around the cylinders. (Compare communications from C. Friedländer * and Ewetzky.†)

In some places the degeneration is so far progressed as to have a network structure. Sometimes, also, we find solid lumps of cells, with offshoots and small cellular tracts, which communicate with one another. Between these tracts the tissue is infiltrated with round cells, except where the hyaline degenerations are found. The increase in tissue is more especially in the conjunctiva palpebrarum. In a few places the structure of the tumor is also noticed in the conjunctiva bulbi, but generally there is a simple infiltration of round cells, hypertrophy, and glandular developments of a tubular nature.

The cell-tracts consist of medium-sized cells with long nuclei, which have no characteristic except that they are placed close to one another like epithelium. In many places it seems that the proliferations of the glands were continuous with the carcinomatous cell-tracts. The cornea is covered in its whole extent by a pannous layer of about 1 *mm.* in thickness, in which there is a great accumulation of round cells. This layer is covered by an epithelium of many layers, made up of large epithelial cells. Prolongations pass from this layer into the depth of the next. In the pannous layer we find the same cylindrical formation as in the carcinoma.

* Ueber Geschwülste mit hyaliner Degeneration und dadurch bedingter netzförmiger Structur. *Virchow's Arch.*, Bd. lxvii.

† Zur Cylindromfrage. *Virchow's Arch.*, Bd. lxix.

The corneal tissue is also densely infiltrated with small round cells, and there are blood-vessels in its tissue which are strongly injected. Between the bundles of muscle fibres in the ciliary muscle we find the same round cells.

The upper lid is almost normal. Immediately beneath the skin, about the middle of the lid, we find one small tumor about the size of a pea, which tumor has carcinomatous structure. This we must consider as a metastasis.

The skin is normal on the under lid, but nothing remains of the muscles or cartilage. Here also we find the carcinoma with hyaline degeneration and round-cell infiltration.

The prolongations of the tumor into the orbit show the same characteristics.

CASE 3.—Frau Unglaube, 67 years of age, presented herself at Prof. Hirschberg's clinic April 27, 1879. She showed a cancer-like formation at the right inner canthus, 3½ *cm.* long and 2½ broad. Has noticed it for six months. Left, Sn. $\frac{15}{200}$ (mac. corn. since childhood); right, $\frac{15}{10}$; + 4 D Sn. 2 in both eyes.

She was operated upon by Prof. Hirschberg on April 29th. The medial third of the upper and lower lids and the skin of the side of the nose were cut away to the bone, the tumor removed, and as it was attached to the periosteum, this was also extirpated. The flap for the upper lid was taken from the forehead, for the under lid from the nose and cheek. The conjunctiva attached to the upper lid by two sutures, to the lower by one. The healing was smooth until the sixth day, when an ulcer of a neuroparalytic character appeared on the cornea, which resulted in the formation of cornea staphyloma. After a year there was no return of the tumor.

A section through the extirpated piece showed that the normal skin had been cut away to the extent of 5-7 *mm.* around the tumor. It was normal up to the border of the tumor and contained hair follicles and glands.

The tumor was about the size of a bean; consistency hard. It was made up for the most part of epithelial tracts, between which was a small quantity of tissue, much infiltrated with round cells and containing blood-vessels. In the vicinity of the tumor, and especially below, was an in-

filtration of round cells; in the lid muscle the same cells were found, and the muscle fibres atrophied.

The epithelial part of the tumor was directly continuous with the epithelium of the outer surface (see fig. 6). Its cells are to be distinguished from the rete Malp. in that they are much smaller, and only those which lie on the connective-tissue septa show their cylindrical character. In the middle of some of the epithelial tracts we see horny corpuscles. The limits of the tracts are irregular and nodular. They anastomose freely with each other.

The surrounding glands show nothing abnormal.

Case 4.—Frau Dresler, 57 years of age, entered Prof. Hirschberg's clinic on Aug. 5th, with a carcinomatous growth about the size of a pea, on the lower lid of the right eye. Two or three years before, there had been a small pimple at the same place, which her husband had scratched off. It has grown larger for some months and bleeds frequently.

It was removed by Dr. Volger on the 6th of August without any plastic operation. The defect was covered simply by using a suture. Healing *per primam.*

The tumor proved to be a carcinoma. It was somewhat larger than a cherry-stone, and was composed of epithelial tracts lying close together; connective-tissue stroma very scarce. In the tumor there is a small infiltration of round cells, but at its edges and near the conjunctiva this infiltration was much more dense. The cells are arranged the same as in Case 4.

The cylinders communicate with the surface epithelium only at a few points, and are made up of very small round elements. There are alveoli in the tumor, but it could not be shown that the basis substance was undergoing hyaline degeneration.

Nothing was left upon the external surface of the tumor except parts of the papillary layer of the skin. The remains of the hair follicles and cutaneous glands are found between the alveoli of the tumor. The conjunctiva is intact, and shows only an infiltration and hypertrophy of glandular tissue in the shape of epithelial tubes. The substance of

the tumor was bare externally, covered only by a thin scab. In this part of the neoplasm, we find alveoli which have small diameters, where, as in the stroma, these are more developed. Between the bundles of muscle fibres we find an infiltration, and the bundles are much smaller than normal.

CASE 5.—Frau Betze, 57 years old, entered Prof. Hirschberg's clinic April 5th, with a carcinoma the size of a pea on her left under lid. She has noticed it for two years. Fig. 7*a* shows the neoplastic thickening of the lid margin, passing over to the conjunctiva at the intermarginal part, where it forms a yellowish, hard, dry cutaneous-looking mass. Removed, and defect covered by a small flap (according to Dieffenbach).

Healing *per primam*, with a small notch in the edge of the lid. The tumor proved to be a carcinoma. The cells in the cylindrical tracts are smaller than those in the rete Malp.; they have large round nuclei, but show no degeneration. The vicinity is infiltrated with round cells. The cells of the tumor are continuous with those of the outer surface of the skin; they are generally round and anastomose with other cylinders, forming a wide net-work. In several places the tissue between the cylinders is remarkably transparent, on account of accumulations of hyaline material. The degeneration in this tumor is of but small extent.

The lid margin is thick and has a carcinomatous mass on it of about 5 *mm.* in thickness; further on we find the conjunctiva infiltrated with round cells, showing only an occasional sinking in of epithelial cylinders. The Meibomian glands are intact (GM, fig. 7), while the muscle of the lid is infiltrated with round cells.

In the lower margin of the tumor are normal glands, and also some which show so great a dilatation that the lumen is about ten times as broad as the epithelium is thick. Some of these canals have an epithelium of several layers. The sudoriferous glands in this condition show the greatest resemblance to the epithelial tracts of the tumor, so that it is possible that the whole tumor has had its origin in their walls. It is questionable whether we can call this

a carcinoma, since the malignity has not been clinically proven. It is also possible that it is an adenoma of the sweat glands, nothing being positive as to its clinical nature.

Case 6.—Herr Wesendorf, 61 years old, came to Prof. Hirschberg's clinic on June 31, 1879. He had a tumor the size of a hazel-nut in the left inner corner of his eye, with an ulceration on its top. It has only been there a short time.

It was easy of extirpation, and a flap taken from the nose covered the defect. The patient left before the healing was complete.

On examination, the tumor showed itself to be granulation tissue, for the most part composed of round cells. It is covered by a thick layer of epidermis, which sends offshoots into the tissue of the tumor, proving a papillary structure.

Besides the papillary arrangement, there are long offshoots which appear to be hair-bulbs and cutaneous glands; and sprouts from the hair-bulbs are occasionally observed. At the place of ulceration the epithelium is wanting. By larger magnifying power the epidermic layer is infiltrated with migrating cells, the nuclei of which are colored deep blue by hæmatoxyline, thus being distinguished from the nuclei of the round cells and those of the epithelium, which are much less colored by the same reagent, and are also smaller than the nuclei of the former cells. They are further characterized by the fact that they are always found in groups of 2–3, just as the white blood corpuscles in the vessels.

These cells are very abundant in the neighborhood of the ulceration, where also the cells of the connective tissue and the stroma of the granulation tissue are most numerous.

According to the above conditions we can only call the tumor a papilloma.

The sections were made with a microtome, and colored with different reagents as carmine, picro-carmine, but principally with hæmatoxyline. The last colored the nuclei a deep purple. A double coloring of hæmatoxyline and eosine was also used, as muscle tissue, etc., differ in intensity when colored in this way.

I return thanks to Prof. Hirschberg for his kindness in

placing the material at my disposal, and also to Dr. Friedländer for his kind assistance in the histological examinations.

Explanation of Figures. (Plate i.)

Figs. *a*, 1, 2, 3, 4, 5, refer to Case 1.

Fig. *a* shows the clinical condition—to the right, the outer, to the left, the inner surface of the lid.

Fig. 1.—Part of a section through the carcinomatous tumor of the under lid. *E*, epithelial tracts. *S*, stroma, densely infiltrated with round cells.

Fig. 2.—Portion of the inferior oblique muscle where it is in connection with the tumor. The atrophied muscle fibres are separated from each other by carcinomatous tissue in some places, and by granulation tissue in others. *E* and *S* as above. *M* is the muscle.

Fig. 3.—Glandular proliferation in the conjunctiva bulbi. *A*, *B* and *C* are glands lined with cylindrical cells. *E.c.* is the epithelium of the conjunctiva bulbi; *Co*, the conjunctival connective tissue, infiltrated with round cells.

Figs. 4 and 5.—Meridional section through the ulcer of the cornea to the right; the cornea very thin; left, normal cornea, which lies more to the centre. *E*, epithelium of the normal portion of the cornea, and also of the epithelial tracts which are growing into the granulation tissue. *B*, Broman's layer, folded at its end, lying in the mass of the tumor. Below is normal cornea. *C*, substantia propria corneæ. *D*, Descemet's membrane; between this and the sub. prop. are round cells.

Fig. 6 refers to Case 3, and represents a part of a carcinoma next to the normal skin. *E* is the epithelium of the skin which communicates with the mass of the tumor *C* by two narrow tracts at *V*, *V*. There is a direct communication between the external epithelium and the carcinoma. At *D*, *H* we find hyaline degeneration. *S* is the stroma, infiltrated with round cells.

Fig. 7 refers to Case 5, and represents a section through the under lid. Lid much thickened at *L* by carcinomatous growths, *C*,*C*,*C*, which lie under the skin, *Cu*. Near the tumor the skin is very thin, *Cu*, but up to this part it is normal. *Sc* is the subcutaneous connective tissue; *Co*, the normal conjunctiva palpebræ. *S*, subconj. connective tissue. *T*, lid cartilage, with *G M*, the Meibomian glands. *M*, the muscle orbic. palp.

Fig. 7*a*.—Clinical aspect of Case 5.

THE MALIGNANT TUMORS OF THE EYE.*

By J. HIRSCHBERG, of Berlin.

Translated by William C. Ayres, M.D., of New York.

(*With three lithographic plates, ii, iii, iv.*)

THE malignant growths in the eye are not only important in themselves, but also for the light they are apt to throw on obscure parts of general pathology. In 1864 Virchow published his fundamental work on tumors, and declared that in the clinical observation of their course and character everything was still to be done. Ophthalmologists have recognized his teachings, and having exact methods and fortunate circumstances for diagnosis, have applied them to the eye and furnished important contributions to the development of clinical onkology.

As early as 1868 v. Græfe, Knapp and others described minutely the etiology and clinical course of the principal tumors of the eye, and showed that they were localized new-formations, and by this discovery threw light upon many questions as to the general nature of tumors. They furnished, especially, examples of the general law of Virchow, that malignant tumors begin as localized affections which, if removed at an early stage, never return. They spread to distant parts by dissemination and metastasis.

In the following I will confine myself to the three principal forms of tumors in the eye, illustrating them by clinical histories and anatomical preparations, with a few remarks on each case.

* The substance of this paper was read before the Hufeland Society, of Berlin, January 25, 1880.

1.—*Glioma Retinæ.*

Case 1.—December 12, 1879. Otto Frank, 1 year old. The mother has noticed a bright reflex from the right eye, for about six weeks; the child otherwise healthy. The left eye normal; the right is blind, squints outward, but is free from irritation. The pupil dilated to a medium size, and a yellowish reflex is seen which comes from a tumor close to the posterior surface of the lens. The tumor is slightly but irregularly vascular, and has a few white spots on it which have a fatty reflex.

Enucleation. Healing as usual.

On August 20, 1880, the child was well; the left eye strong and natural both externally and internally. Since glioma retinæ in the majority of cases returns within four weeks after enucleation (in 12 of 24 cases); often after two months (in 9 of 24 cases), and seldom after three months (in 3 of 24), the prognosis must be considered good in this case, for eight months have passed without relapse.*

After having hardened the eye in Müller's fluid, I opened it in its horizontal meridian on December 23, 1879. (See fig. 1, plates ii, iii.) The globe was 21 *mm.* long and 24 *mm.* broad. The change was principally in the posterior half of the retina. In this region it was converted into a solid but soft fungus-like growth, which completely filled the posterior half of the globe, resting upon the normal optic nerve. The papilla was also normal macroscopically. The retina is thickened, appears gray in section, and is traversed by large yellowish-white tracts, with here and there a fissure with smooth, shining walls. The posterior surface of the tumor is smooth and is not attached to the choroid. This membrane is normal. To the side the neoplasm commenced abruptly from the normal retina, whereas, in the lower half there are folds with white miliary spots showing the beginning of a dissemination. The anterior surface of the growth is irregular; the vitreous is flattened to the thickness of only 5–10 *mm.*, is adherent to the pars ciliaris retinæ, and fills out the space between the tumor and the lens. Laterally there is a

* Compare Hirschberg, *Markschwamm der Netzhaut.* Berlin, 1869, page 250.

space 6 *mm.* long and 4 *mm.* broad, showing partial detachment of the vitreous. The remainder of the eye normal.

The microscope shows first that in the soft parts of the retina its tissue is still normal. In the region of the ganglion cells there is a narrow zone of small round cells, and in the innermost layers of optic-nerve fibres there is a network of fine fibres enclosing cells and nuclei, and running radiately or parallel to the surface of the retina. In another preparation (fig. 2) the beginning of the glioma is plainly seen. The pigment layer is slightly proliferated in an irregular manner. The rod-layer, both in unstained preparations and in those colored with eosine and hæmatoxyline, shows its elements indistinct, and the whole layer attached to the pigment layer by an exudation which is homogeneously colored by the reagents. The granular layers are but little changed; the gray layer thickened and rich in cells. The principal thickening is to the inner side of the retina, caused by a diffuse or nodular layer upon the ganglion cells and optic-nerve fibres. This new-formation is a fine net-work, with small round cells, of about 0.008 *mm.*, with nuclei of 0.006 *mm.* and smaller. Blood-vessels pass into it radiately.

Such microtome sections (fig. 3), which show 10–15 *mm.* of normal retina, with small glioma nodules (2 *mm.* broad and 3–4 *mm.* high), like polypi, on its inner surface, are characteristic of that species of glioma which grows inward (glioma retinæ endophytum). (Fig. 2, plates ii, iii).

(*a.*) On the other side, near the nodules, the outer and middle layers of the retina are normal; the pigment layer regular; the elements of the layer of rods and cones somewhat indistinct; limitans externa sharply defined; granular and intergranular and gray layers unchanged. At the layer of ganglion cells and optic-nerve fibres is a net-work tissue with numerous small cells, the number of these cells decreasing gradually toward the anterior portions of the retina, while the radial fibrillæ become more distinct.

On the inner side of the retina lies a thin new-formed layer (see fig. 4, plates ii, iii), the thickness of which is variable, but generally thinner than that of the optic-fibre layer, viz., 0.03 to 0.06 *mm.* It is separated from the retina by a

thin space about 0.02 *mm.* wide, but is connected with it by broad and narrow strings of tissue, so that it must be considered as belonging to the retina. It is composed of fibrous net-work, with numerous round cells and rod-like nuclei, the fibrillæ running parallel when they approach the retina.

(*b.*) On the other side, near the nodules, the pigment layer is partially defective, and the bacillar layer is changed. This shows the same carmine coloring as *a*, but is made up of short fragments of *inner segments* of the rods which lie upon an amorphous layer of exudation containing pigment cells, nuclei and round cells. The granular layers are narrow, and the intergranular layer only represented by a thin stripe of tissue between them. The gray layer is not sharply defined inward. The whole inner part of the retina ($\frac{2}{3}$–$\frac{3}{4}$ of its thickness) consists in a radiating net-work (*R*) with round cells, rod-like nuclei, and blood-vessels. Fine and large capillaries run almost perpendicular to the inner surface of the retina.

(*c.*) At the nodules the retina has about the same structure as in *b*, only that the pigment layer is preserved. The nodule itself is made of an increase of cells from the inner half of the layer *R*, while the outer half, which contains the principal blood-vessels, is still to be seen between the nodule and the retina. The nodules themselves are made up of round cells, which color violet with hæmatoxyline, and are grouped together like the grains on an ear of Indian corn. They run in confluent bands toward the vitreous, sometimes forming round isolated figures, in the centre of which we find microscopic spaces, which are either empty or filled with cells or blood-vessels. The blood-vessels have distinct walls, are large, being frequently the size of the primary branches of the central artery. The interstitial tissue is scarce, but it is seen near the edges of the tumor as a delicate net-work of fibres.

Between the violet-colored nodules we notice places colored by carmine, in which masses of small shrunken cells are to be seen; but the failure of the nuclei to color characterizes the cells as decayed. There is an areolar zone of

tissue around some of these cell clusters, as if fissures were going to be formed.

According to the description it is beyond a doubt that the tumor takes its origin in the inner layers of the retina. Both granular layers pass over the nodules, and do not take the least part in their formation.

The inner surface of the retina is convex and irregular toward the vitreous; the outer surface is normal and has the bacillar layer unchanged over the whole background of the eye.

In sections (fig. 4) where there are larger tumors on the inner surface of the retina (about 10 *mm.* broad and 6 *mm.* high), the adjacent retina is normal, or at least very little changed.

On one side, and close to the tumor mass, the following conditions are to be noticed: The molecular layer is finely fibrillar, punctated, and contains but few cellular elements. Inward from it we notice two layers: the one rich in cells (*o*), 12–15, even 25 layers deep, lying in a large net-work tissue; the other, interior to this, is thick and transparent, contains but few cells (*K*), is made up principally of a network of fibres, and forms the inner contour of the retina. The cellular layer *o* does not take part in the formation of the tumor, but becomes narrower beneath it (sometimes to only six rows of cells), and is separated from it by a thin layer of connective tissue, the fibres of which run parallel to the surface of the retina. In the vicinity of the tumor we can notice an hypertrophy of the inner granular layer, which is diffuse, or bent so as to be convex outward: in this the cells are arranged radially. The outer granular layer does not take part in the neoplasm, except that in some places it is confluent with the inner.

On the other side of the tumor the following is found: epithelial and bacillar layers have their distinct elements; the two granular layers and the intermolecular and the gray layer lie regularly upon one another. Inward from these is a layer (*o*) about one-third the thickness of the whole retina, which corresponds to the layer of ganglion cells and optic-nerve fibres. The layer *o* is divided into two layers, especially near the tumor, the inner of which is principally com-

posed of cells, and the outer of radiating fibres. This layer contains the principal blood-vessels. In one of the vessels of the section we notice a proliferation of the cells of the adventitia to 5–10 cells deep. (See fig. 4, plates ii, iii.) Internally to this we find another new-formed layer *n*, 0.03 *mm.* thick, which is sharply defined from *o*, the same as we have seen in other specimens. These two layers are united by a thin, transparent zone of connective tissue, which contains cells and fibres running parallel to the surface of the retina. It contains glioma nodules (fig. 5, plates ii, iii), and passes directly into the mass of the tumor.

The tumor shows also that its basilar surface is somewhat larger than the surface of its attachment to the retina. In the greater part of its extent the cellular neoplasm is separated from the layer *o* partly by a layer of connective tissue, which runs parallel to the surface of the retina, and partly by the radiating fibres of Müller. Here and there the layer *o* is connected with the tumor mass by large tracts of round cells. In the thick parts of the tumor there is hardly a trace of stroma, but an areolar structure is sometimes recognizable, having sharp contours, the cells being grouped in three or four layers. The groups are close together and the cells confluent. In the vicinity of the base of the tumor there are large blood-vessels, with thickened walls, filled with yellow granular masses, which are degenerated blood corpuscles. At the free surface the acini are larger, more irregular, and have sharp inner contours. (See fig. 8, plates ii, iii.)

In this case we see on the inner surface of the tumor the small ragged nodules, of the rarer *glioma endophytum* differing from the usual form which shows large nodules on its surface. This is easily to be seen since the vitreous is still found in front of the retinal tumor. The tissue of the vitreous is almost homogeneous, but is punctated and striated, especially at its peripheral layers. In it are one or two remarkable round cells which look like bubbles. It is separated from the surface of the tumor by microscopic spaces, but occasionally it is attached to it by a thin layer of tissue.

Immediately beneath the surface of the tumor among the glioma cells (which take a deep blue color with hæmatoxyline) we notice large round, cylindrical or flat collections of cells which are not colored. They consist of round, indistinct elements which represent cells or nuclei. These cells are to be considered as decayed and are evidently the elements which give the tumor its fatty reflex. (Comp. fig. 6, plates ii, iii.)

This species of tumor is rare, and is further remarkable from the fact that, at the time of the operation, although it had filled half of eye, the posterior layers of the retina were still intact, thereby allowing a histological examination of its origin.

Before going to other cases I would like to make two remarks:

(A.) In the literature of glioma we can distinguish four stages:

1. The first and oldest period (pre-histological) is that which comprises the writings of Wardrop (1809), Panizza, Lincke, and a number of other authors. It closes in 1836 with B. v. Langenbeck, where he declares the tumor to be a hyperplasia of the retinal granules, as determined with the microscope.*

2. The middle period comprises microscopical examinations from Sichel and Robin, Schweigger and A. v. Græfe, Horner, Rindfleisch, and others.

3. The later period began by Virchow, and includes special papers by A. v. Græfe, Knapp, and others (1864–1869). The ordinary glioma retinæ had its origin in the inner molecular layer (Hirschberg.)

In this period the clinical condition was well defined, and retinal glioma has since figured regularly in every clinical report, in fact, somewhat too frequently, as also inflammatory cases (pseudo-glioma) were included.

4. The latest period extends from 1869 up to the present day. In 1879, Vogler collected the observations of this whole period and published them in these ARCHIVES (vol. viii. page 374). There are 60 cases collected in this report,

* Compare Hirschberg's Glioma retinæ, pages 2 and 5.

and in my monograph 77, so that there is a sufficient material for observation. In general, the experience of the 3d period is substantiated, except that the formation of metastases is more fully determined, and, further, the following facts were pointed out: (*a*) Traumatic origin in one case, by Steinheim. (*b*) The possibility of curing a relapse by evisceration of the orbit, by Alfred Græfe. Before this such treatment was not practised, so that only those tumors which were strictly confined to the eyeball were operated upon with lasting effect.

In exceptional cases (A. v. Græfe, Hirschberg, M. Landsberg, Mooren) extirpation was successful after the optic nerve was implicated.

The first case, mentioned in my monograph (Ida S., 5 years old, etc.), enucleated by A. v. Græfe, has had no return, now over 12½ years since the operation. The tumor filled $\frac{1}{3}$–$\frac{1}{2}$ of the cavity of the eyeball, and was a typical case of glioma (exophytum).

(B.) The usual form of glioma retinæ begins in the inner granular layer, and grows outward toward the choroid (glioma retinæ exophytum). In rare cases it begins in the inner layers of the retina and grows inward. (Glioma endophytum according to my nomenclature.)

Manfredi was the first to relate such a case* (see my monograph, page 11).

His case was of a boy 3 years old who had had a peculiar discoloration of the right pupil for about 4 weeks. On Jan. 8, 1868, a bright reflex from the bottom of his eye was noticed, which, on using atropine, showed itself to be a tumor of the retina. It was enucleated Jan. 24, 1868, by Quaglino, and the boy sent out of the hospital on Feb. 4, 1868, in a healthy condition. The eye was normal externally; put into Müller's fluid, hardened, and cut through vertically on Feb. 21st. A lobular tumor filled over one-

* The following short notice is found in Bader's "Changes of the Human Eye," London, 1868. Trübner, page 10: "In one case the growth (cancer) appeared primarily in the retina in the shape of grayish-white and opaque nodules, some of which were ill-defined, and seemed to originate in the layer of the retina adjoining the optic-nerve fibres. The outer surface of the retina was not adherent to the choroid." Without more explicit communication this can hardly be counted.

half the cavity of the globe and came from the detached retina. The microscope showed it made up of round cells, with large nuclei and but little protoplasm.

"The growth started probably from the nuclei of the radiating fibres, and developed from the limitans interna." In thick sections small nodules are recognized as remains of the stratum bacillosum. No return up to the beginning of 1869. The histological origin is distinctly given by Manfredi. There were two features which differed from my case: 1st, the typical vascularity, and 2d, the detachment of the retina.†

Then follows the excellent paper of Iwanoff, in which he distinguishes two kinds of glioma—one, the usual form, from the inner granular layer, and, besides, another which originates in the layer of optic-nerve fibres.

November 12, 1868, a boy 2 years of age was admitted to O. Becker's clinic. His right eye presented the condition known as "amaurotic cat's eye." On examination, the peripheric portions of the retina showed a shiny, yellowish-white region, which encroached upon the vitreous. It was round, and seemed sharply defined from the neighboring tissue. A diagnosis was made of probable glioma, and the eye enucleated November 13, 1868. The tumor was the size of a small hazel-nut, and was situated in the retina to the nasal side. The other membranes were normal, except that the vitreous was detached by a serous exudation through about one-third of its extent. It was easily seen with the loupe that the growth was from the inner superior surface of the retina, and, further, that it was developing inward, the whole inner surface of the retina having small nodules scattered over it. On raising up the sides of the tumor, it was easily observed that it connected with the retina only by a narrow pedicle. At the places where the retina seemed normal, the layer of nerve fibres was filled with round cells, but not thickened. On the inner surface there was a new-formed layer, 0.08–0.2 *mm.* thick, which was made up of fibres and cells. In many places these fibres were offshoots from the radiating fibres. The nodules were produced by collections of cells in this layer. The layer of nerve fibres was also densely infiltrated around these nodules. The

† The microscopic condition corresponded more to glioma r. exoph. All nodules had their convexities outward in the detached retina.

cells of the radial fibres were swollen, and proliferating by division. New-formed vessels grew from the retina into the larger nodules.

Another kind of nodule was formed from the tissue of the retina itself, consisting in a simple thickening of this membrane by dense accumulations of round cells in the fibrous layer. One or two blood-vessels were always found in such nodules. The inner layer of granules took no part in the proliferation, except in the larger nodules, where both the nerve-fibre and the inner granular layers merged into each other. The layer of rods and cones, the outer granular and intergranular layers were normal over the whole retina. The larger patches were very vascular, and the cells surrounded the blood-vessels in thick rows. The tumor was made up of an aggregate of such patches.

The neoplasm was formed from the connective-tissue cells in the layer of nerve-fibres and from the cells of the adventitia of the vessels. The cells of the inner granular layer were implicated later. The tumor developing inward caused no detachment of the retina. It is a form of glioma which is much rarer than that which grows outward.

I have given this case of Iwanoff minutely, because I believe that it is precisely analogous to mine. I would, however, make the distinction that in my case the principal mass of the tumor has come from the radiating fibres, in which the connective tissue of the nerve-fibre layer has taken part; also from the adventitia of the blood-vessels.

In 1870 I published, in conjunction with L. Happe, a case of glioma endophytum, and made the following observation: From an anatomical standpoint, there seem to be two kinds of glioma,—the one which develops outward (glioma ret. exoph.), and the other, a rarer form, which grows inward (glioma ret. endoph.); and the two are to be distinguished in clinical diagnosis. In the first form, the inner surface of the tumor is smooth and round; in the second, it is mostly irregular and ragged. Histologically there is no difference between them * any more than there

* E. Meyer, of Paris, who saw these preparations, says he examined a similar case where there was a ragged surface, and made the diagnosis glioma, which was at variance with other specialists there, and the enucleation therefore not performed. The result was perforation and the usual consequences.

is between a gliosarcoma of the retina and the ordinary small round-cell glioma. Our case was the following:

Immediately after the birth of a female child, a yellow reflex was noticed from the right eye. After 20 weeks, phthisis bulbi, blood in the anterior chamber, etc. After 30 weeks, enucleation. One year later, the same condition commenced in the other eye, which became blind, but there was no return in the right orbit. The posterior half of the eye is unchanged. In the anterior, is a tumor several lines thick, which had the structure of glioma.

This case is remarkable, since it combines the conditions of being congenital, and also appearing symmetrically on both sides.

As to the result of the case, I received from L. Happe the following:

August 27, 1880.—The right eye was enucleated at the age of six months, and the right orbit remained free from relapse for more than six months, notwithstanding that the left eye had been blind from a gliomatous growth in the meantime. The condition continued up to the third year, without any change in the left eye. Six months later the parents wrote me that the child had such pains that they wished the left eye also to be removed. It was much enlarged, and had an oval shape; the anterior chamber clear; the lens cloudy; no blood, as in the other eye. The parents were told that although there had been no return in the right orbit, the chances were not so good in the left, and it was highly probable that the child would have a return of the pain soon after the operation, and that death would also be the probable result. The operation still being insisted upon, the large oval globe was removed. Its conical posterior part passed over into the thickened optic nerve, which, although divided as far back as possible, presented a gelatinous-looking cut-surface. A return was noticed eight days later, and soon passed the fissura orbitalis, and the child died in the third week. The right orbit remained free up to the time of the second operation. Soon after, the father died of phthisis.

It is not impossible that some of the cases of glioma found in recent literature were of the kind which grows inward, but either the late stages at which they have

been removed, or the inadequate descriptions cause their failure to afford satisfactory evidence.*

An interesting case, published by W. C. Ayres (ARCHIVES OF OPHTH., 1880, June 1, page 174), was directly described as glioma retinæ endophytum by the author.

I do not mean to distinguish glioma ret. endoph., as a small-cell perivascular sarcoma, from glioma ret. exophytum. The term "glioma retinæ," introduced by Virchow, is sanctioned by an extensive literature; yet if other authors wish to designate glioma retinæ, anatomically or clinically, as small-cell sarcoma, I have nothing to say to the contrary. (See Glioma, page 133, in *Nagel's Jahresbericht* for 1871, page 305.)

In the beginning, the disease is strictly a local one, but soon becomes general, and is only to be cured in its earliest stages by radical extirpation, but by this process it can be cut short with certainty.

In a communication made by myself in these ARCHIVES, vol. ii, p. 235, I endeavored to present a section of an advanced glioma, in its normal fresh color, but the attempt not having been quite successful I would like to publish a recent case for the same purpose.

CASE 2. On the 26th of August, 1870, Louisa Rätsch, $3\frac{1}{2}$ years of age, was admitted. Parents healthy, the child also up to a short time ago. On Christmas, 1879, a bright reflex was noticed from the left eye. The eyeball has lately been enlarged, pushed forward, and is exquisitely painful.

The right eye is healthy, the left enlarged and protruding. Pericorneal injection, +T2. Cornea clear. Pupil ad maximum dilated. Lens of brick-dust color and pressed against the cornea. Light reflex from the eye but not distinct. Above and below are ciliary staphylomata, evidently secondary tumors in the choroid.

Diagnosis, glioma retinæ O. S. in the beginning of the third stage (extrabulbar expansion). Operation necessary to allay the pain, although a clear extirpation was hardly to be hoped for. After narcosis an endeavor was made to cut the optic nerve at the apex of the orbit, which was difficult, since but little space

* A marked and well-described case of this kind, illustrated by drawings, was published by I. Delafield in these ARCHIVES, Bd. i, page 58, in 1871.—K.

was left between the eye and the orbital wall. Enucleation in the usual way. The distal end of the cut nerve looked reddish-gray, and was swollen, and in the depth of the orbit there was a hard nodule the size of a bean, otherwise the orbital tissue normal.

This nodule went to the foramen opticum and was evidently the remainder of the cut optic nerve. It was afterward removed, but still the end was diseased, and although the operation stopped only in the foramen, the tumor was not cleanly extirpated.

The piece of nerve was 12 *mm.* long and 9 *mm.* thick, and its section had a reddish-gray color, especially toward the eye, presenting the appearance of a swollen lymph gland. The eyeball was 28 *mm.* long.

The eye was immediately opened, when a chocolate-colored fluid ran out (see fig. 9, plates ii, iii). Cornea unchanged; sclera thin. The retina detached, thickened and running forward in a funnel-shaped expansion between two large tumors in the choroid. The posterior half of the funnel is medullary, soft, and colored grayish-red, traversed by a few yellow streaks.

The anterior half is covered by irregular gray, red and yellow spots. The retina is attached to the ciliary body by a thin yellowish layer, representing the shrunken vitreous. The iris is pushed forward, and in the region of the pupil is the brick-dust-colored lens. Near the optic nerve the choroid is swollen into two nodules, the one 14 *mm.* long and 8 *mm.* thick; the other, which is flatter, measures 8 *mm.* long and 4 *mm.* thick.

Both nodules pass forward and terminate in the equatorial part of the choroid, which is slightly thinned and bleached. It is also partially covered by a thin yellowish membrane. That part which is thinner than normal is 3-4 *mm.* in extent on both sides of the eye. Further forward it is again swollen to a medullary tumor about 4 *mm.* in thickness, reaching forward to the insertion of the iris.

The posterior half of the detached retina is made up of small round cells, dotted with yellow spots. The choroidal tumor is also composed of small cells, interspersed with short spindle-shaped or cuboid pigment cells. The section of the optic nerve shows only small round cells.

The child was discharged after eight days, apparently in a good condition, and fourteen days later I also heard satisfactory reports.

II.—*Sarcoma Uveæ.*

CASE 3.—The history of this case is already given in these ARCHIVES, vol. viii, pages 372, 373, accompanied by drawing. The woman was 62 years of age, and the eye was removed at a time when there was no irritation, the only thing complained of by the patient being a narrowing of the field of vision to the nasal side. She could read the finest type.

The tumor was about 14 *mm.* long and 10 *mm.* wide, and restricted to the choroid and ciliary body. After a year the patient was not troubled by local or metastatic symptoms. The tumor was removed Oct., 1878, and she died July 4, 1880, after having suffered greatly from carcinoma of the liver. *As to the latter disease, I communicate the following from Dr. Stadthagen*:

"Frau K. was well until the end of last winter. In March of this year, I examined the liver, and found it greatly enlarged. Irregularities of surface I did not diagnosticate during life, although several parts of the organ were sensitive on pressure. She died in the beginning of June. At the *post mortem* I found many cancer spots of various sizes."

On examination the following was found (see fig. 10, plates ii, iii). The neoplasm is 12 *mm.* long and 6 *mm.* thick; shows an irregular posterior surface. Anteriorly is a spherical thickening in the ciliary body, and it terminates posteriorly in a triangular (in section) swelling of the choroid. The pigment epithelium of the ciliary body remains, but is covered by an unpigmented layer from the tumor anteriorly. The ciliary portion of the tumor, slightly magnified, appears brown except in two circumscribed places where the cells are colored blue with hæmatoxyline. The tumor nodules in the choroid are slightly pigmented. With the loupe, delicate septa are seen, which run almost perpendicu-

larly from surface to surface in the middle of the tumor; further forward and also backward the septa are concave and finally run irregularly through it. On the ends the septa disappear and a few blood-vessels are seen. Pigment is scattered through the tumor.

Same specimen magnified 300-400 times. The pigment of the ciliary body remains. Numerous blood-vessels filled with red blood corpuscles. Smooth muscle fibres cut in different directions are seen in a tissue containing small round cells and fine fibres.

Numerous round and spindle cells, also cuboid or spindle-shaped pigment cells are scattered through the tumor. The pigment is more abundant toward the scleral surface, and also posteriorly toward the choroid proper. In the choroid, the pigment cells are long, cylindrical or spindle-shaped, sometimes with long offshoots (0.07 *mm.*, cell-body 0.02 *mm.*). Between these are also small cells without pigment.

The cells of the choroidal tumor are round or spindle-shaped, with large nuclei (cells 0.012 *mm.*, nuclei 0.008 *mm.*). They are closely packed together with but little intercellular tissue. The septa are fibrous, with rod-like nuclei, and sometimes contain blood-vessels. The nuclei are frequently surrounded by pigmented protoplasm. In some places large lumps of pigment appear in the septa and also at their nodal points (see fig. 11, plates ii, iii).

While glioma occurs only in children under 12 years of age, and is often congenital, sarcoma only happens in adults or even in elderly individuals, with the exception that white sarcoma may also happen in childhood.

Sarcoma of the choroid develops slowly and without pain to the patient. The difficulty in diagnosis, as v. Græfe has pointed out, lies in the tumor being covered by the detached retina.

Every detachment of the retina in elderly individuals, which comes on without an accident and without pain, is suspicious. Myopia and lengthening of the axis of the eye is the usual cause of spontaneous detachment, but sarcoma can also happen in such eyes, as I have noted in my "Contributions to Practical Ophth.," vol. ii, page 47. One year

after the operation the patient was still healthy. Sept., 1878, 1½ years after enucleation, symptoms of liver disease. *Hydrops ascites;* puncture necessary. Death, Oct. 20, 1878.

I have noticed a second case which I related; first, on account of sympathy from a completely degenerated eye; secondly, because death was caused by the tumor.

Case 4.—Herr P., 34 years of age, always near-sighted (3 D), suddenly experienced pain in his right eye, which at the time had good sight. Two months later detachment of the retina was diagnosticated. Four weeks ago, was blind suddenly in his right eye and had severe pain.

Status præsens. July 23, 1880. The patient is healthy and complains only of his right eye. Left myopia 3 D; vision normal, as also his retina. The right eye shows pericorneal injection. Shallow anterior chambers. $+T_1$. Pupil dilated and somewhat opaque. Detachment of the retina diagnosticated. Suspicion of tumor. Enuclio bulbi d. The eye placed in weak Müller's fluid, and when opened, on the next day, a small quantity of chocolate-colored fluid ran out. A tumor the size of a large hazel-nut is attached to the choroid by a broad basis near the posterior pole. It has a fungoid expansion, and reaches to within a few millimetres of the posterior surface of the lens. The remainder of the choroid is of normal thickness and the retina detached up to its ciliary portion. The cut surface of the tumor is bright, with small points which toward the surface are brown in color. In the lens there is a cloudiness resembling a zonular cataract. The sclero-corneal capsule normal. After hardening it is recognized as a round-and spindle-cell sarcoma, containing but little pigment.

Spontaneous detachments of the retina happen not quite so seldom in eyes that are not myopic or only slightly so, and, therefore, the diagnosis of a beginning sarcoma is difficult. Diminution in tension is in favor of simple detachment, while normal or increased tension is more in favor of a tumor of the choroid. Sometimes there is a brownish reflex, but often it is difficult to diagnosticate a tumor even when the retina itself is transparent. In doubtful cases I would advise puncture of the choroid in the same manner as it is used in treating detached retina. If it be a case of

detachment it is generally much improved, so that the background of the eye can be examined. If it prove to be a tumor, enucleation must be done immediately.

Sarcomata of the choroid have the peculiarity that when they develop slowly they are generally complicated by metastatic tumors of the liver. In the second, glaucomatous stage of choroidal sarcoma, these tumors are, in contradistinction to glioma retinæ, still curable by enucleation, though not in the majority of cases. In some, however, the patient comes in this stage, his eye is enucleated and he feels perfectly well for some time, whereas after a year or so he shows distinct symptoms of cancer of the liver, has ascites and dies in a short time. The greatest enlargements of the liver, by melanotic tumors, are caused by primary sarcomata of the choroid. In such cases even enucleation does not always protect the patient from metastasis, as in our second case, while if glioma retinæ is enucleated in its primary stage the cure is certain. No case of sarcoma of the choroid can be considered cured unless at least two years have passed since the enucleation of the eye.*

I have never seen a local relapse of a choroidal sarcoma when the eye has been enucleated while the tumor was still confined within the eyeball. Such is also the experience of Förster.

Melanotic sarcomata may appear in an eye which has been wounded and atrophied, as occasionally an eye with glioma retinæ or sarcomata of the uveal tract may become phthisical for a time. I cannot leave this subject without recording a circumstance which I have noticed, and which, to my knowledge, has not been mentioned before, that is, a successive double-sided sarcoma of the choroid.

Case 5.—On July 6, 1880, a woman of 56 years of age came to my clinic suffering with rheumatism. Seven years before it had

* Such is also noted in Pufahl's case cited in my *Beitr. zur pract. Augenk.*, vol. ii, page 34, 1877. There is a great difference in the prognosis of glioma retinæ and sarcoma chor. Glioma has only a short primary stage in which it is curable, but if the tumor is removed while it is still encapsulated in the eye, there is a great probability that it will not return. Sarcoma of the uveal tract can also be cured after it has existed for a longer time, but by no means with so much certainty.

been accidentally discovered that she was blind in one eye, which then was enucleated by Dr. Schleich, at Stettin, in March, 1879. He was kind enough to write me: "The patient came to my clinic on January 24, 1879, with the left eye healthy but the right totally blind on account of a tumor which had perforated the globe upward and inward. I performed enucleation on February 25th. Being taken sick and staying in bed four weeks, she was sent to Dr. Pilz, for further treatment. He examined the eye and found an ordinary melanotic sarcoma."

The left eye began to fail at Pentecost, 1880.

Status præsens. Right: anophth. operativ., with no trace of a return. The left eye is free from irritation; the pupil wide; tension not increased; a few episcleral veins strongly injected, especially one above and one below. When the patient looked at the forehead of the observer, a round tumor was visible in the two lower thirds of the pupil. The retina was normal above, but the papilla could no longer be seen. By focal light a large yellow tumor with injected blood-vessels could be seen extending into the vitreous on the inferior nasal side of the ciliary body. Atropine was not used for fear of an acute glaucomatous attack. I could not conclude to remove the eye before it was blind or had become painful. On August 19, 1880, I received a letter from the patient saying that she was blind and was suffering from vertigo. I did not like to consider this second eye as metastatically affected, since there is a general law (Virchow) that those organs in which sarcomata appear primarily are seldom affected by metastasis from other localities. Apart from tuberculous, leucocythæmic and syphilitic metastases, I know of only two intra-ocular metastatic tumors, the one related by Schiess-Gemuseus and Roth, *Arch. of Ophth.*, vol. xxv, 2, page 177, and the other by Perls, *Virchow's Arch.*, vol. lvi, page 437. I would rather believe that the cause which produced the sarcoma in the one eye was also efficient in the other.

III.—*Melano-Sarcoma and Carcinoma Præcorneale*

belong to the rarer neoplasms of the eye. In a large number of tumors which I have observed from 1866 up to the present time, I have only seen two in A. v. Græfe's clinic and two in my own practice. The first two I have published in *Virchow's Arch.*, vol. li, and the others are the following:

A man, 51 years of age, otherwise healthy, came to my clinic on April 7, 1879. He noticed in August, 1878, that a small elevation appeared on the outer corneal margin of his right eye. It had a glassy reflex, grew slowly, and, in the winter of '78 and '79, became black, but did not produce any great amount of pain or disturbance of vision.

The left eye was normal; the right had still a good amount of vision. A deep-black formation was noticed on the eye which looked like a garden snail (compare fig. 12, tables ii and iii). The neoplasm measures 20 *mm.* from above downward, is 16 *mm.* broad, and 10 *mm.* thick. It covers the right half of the cornea and a part of the sclera, and is firmly attached to both. It sends out prolongations, like a thick pannus, along the upper and lower sclero-corneal margins. The conjunctiva bulbi is infiltrated and colored black. The superior tarsal portion of the conjunctival tissue is dotted with white miliary patches which resemble granulations, but are a little less transparent. When the lids are closed the tumor is pressed and forced outward like a broad black cone. The under lid passes under the base of the tumor, the upper one above, where it shows a bleeding spot. It is said to have grown spontaneously.

Now came the difficult question, was the tumor to be removed with or without the eyeball? In conformity with the general law of surgery, and also with special experience in epibulbar tumors, I came to the former conclusion. Both the latest publications on this subject recommend enucleation.*

According to Binsenstein (*Centralbl. f. Augenh.*, 1879, page 346), in cases of melanotic sarcomata on the exterior of the globe, we can only gain a good prognosis by enucleation. Meighan has published two cases (*Glasgow Med. Journal*, 1879, and *Centralbl. f. Augenh.*, 1879, page 283) which were observed in the Glasgow Eye Infirmary. In the first the eye had to be removed after six relapses, and in the second after three.

In my case the patient had let the tumor grow to an unusual size, and no more prudence was to be expected from him in case of a relapse. Every careful surgeon, were he the patient under consideration, would certainly have preferred a radical enucleation to a simple removal of the tumor.†

* A complete collection of the literature on epibulbar tumors is found in the paper of Noyes, these ARCHIVES, vol. ix, page 145. The case of Sæmisch (Handbuch, iv, 1, p. 312) seems analogous to mine.

† This opinion is very much strengthened by the fact that in such cases, or when they are a little more advanced, the whole connective-tissue portion of the

Following the results of experience, I enucleated the eye, and also cut away the whole of the conjunctiva and the tarsi. Healing in the usual way; of course with complete attachment of the lids to the conjunctival sac. I have not seen the patient since his dismissal, but learned by letter that he was well (Sept. 3, 1880, or 1½ years after enucleation).

On April 11, 1879, I made a horizontal section through the eye, which is represented in fig. 13, plates ii, iii. The tumor had grown into the cornea and sclera. There is a septum which passes into the neoplasm, dividing it into fine segments; the outer surface is covered by a thin membrane, and its cut surface is dark colored.

The best idea of the structure of the tumor is given by thick preparations made with a microtome, which include the sclero-corneal capsule (compare fig. 14, plate iv). The epithelium of the cornea passes over to the surface of the tumor, where its cells are at first eight or ten layers deep, but afterward become reduced to one-half or one-third of this thickness.

The individual epithelial cells are large and flat; have nuclei, and are packed close together. They are slightly pigmented in the middle layers, from the fact that they contain yellowish-brown nuclei. The tumor is not covered by regular epithelium, the irregularity being probably the result of pressure from the lids. Posteriorly, where the tumor is smaller (toward the sclera), there is a layer of epithelium, ten or twelve layers thick, the deeper cells of which are cylindrical, the superficial ones flat. They are very distinct, and contain one nucleus each.

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eyeball is infiltrated with small sarcoma cells, which must have existed long before the tumor has become macroscopically visible. A third case of epibulbar melanosis was observed in my clinic on July 3, 1880. The patient was a man 56 years of age; consulted me because he had been advised by a physician to have his eye removed, although his vision was still good. His left eye has been weak since childhood; has a posterior polar cataract, and can only read Sn 12 at 5" with difficulty. His right eye has been yellow for 20 years; dark spots have made their appearance for about five; black nodules for two years. At present there are four black nodules on the conjunctiva bulbi, the largest of which is about 6 *mm.* in breadth. There is also a black spot in the conjunctiva above, in the region of the sclero-corneal margin. A dark discoloration reaches back to the equator, and also passes over to the lid. A clean extirpation of the tumor was impossible without enucleating the globe, nor could I make up my mind to blind the patient by an operation, while a partial removal was worse than nothing.

At the end of the tumor, or where its surface passes over to the sclera, there are two projections from the neoplasm, which between the epithelium sinks into the depth with a thickness of about 30 cells.

The tumor covers the cornea over an area of 5 *mm.*, and the sclera of 9 *mm.* The corneal tissue is normal, except that Bowman's layer is wanting. In the anterior part there is an artificial space between the cornea and tumor, but further toward the sclera they are firmly united, so that the pigment cells of the tumor and the corneal cells are continuous with each other. There is also such an artificial space between the basilar layers of the tumor and the scleral tissue. The superficial layers of the latter are infiltrated with small cells, whereas, within the scleral tissue, there are perivascular accumulations of small cells which are unpigmented.

The tumor undoubtedly deserves the name præcorneal, which I have used in my first case in *Virchow's Archiv*, vol. li. Its basis is at the sclero-corneal junction, where it is firmly united to deeper tissue, while further forward and also backward there is an artificial space between.

Beginning with the basilar layers of the neoplasm, anteriorly there is a thin layer of fibrous connective tissue, with rod-like nuclei, running parallel to the cornea, and much resembling its structure (see fig. 15, plate iv). Next to this comes a layer of the tumor proper, which is made up of two kinds of cells irregularly mixed with one another: *a*, small cells containing nuclei, which are closely packed together with but little intercellular substance; *b*, yellowish-brown pigment cells, containing large nuclei, sometimes one, two, or many within the same cell. For the most part these cells are spindle-shaped or stellate.

At the basis of the tumor the structure is changed by the appearance of numerous blood-vessels with thin walls. They are empty, and lined with a distinct endothelium. Here the pigment cells are more numerous, smaller, round or polygonal, and contain large flakes of yellow pigment. This pigment is also seen lying free in the tissue. The part which connects tumor and cornea, is traversed by numerous

blood-vessels, and has less pigment. There are also numerous cells at this place which can be distinguished from the other only by a slight perinuclear pigmentation. The pigment cells run in as far as the normal corneal tissue, but within the cornea there is no pigment. In the præcorneal layers the pigment cells become larger, more spindle-shaped, and darker colored; the blood-vessels are more numerous and larger, contain more blood, and have thin walls. The condition at the anterior end of the sclera is very peculiar (see fig. 16, plate iv). Its superficial layer is infiltrated with small unpigmented cells; then comes a layer of fibrous tissue (episcleral or submucous) not so densely infiltrated; next a broad layer, filled with small cells, like granulation tissue, in which there is a network of black spindle-shaped or stellate cells along the walls of the blood-vessels. It makes the impression that the tumor has sprung from the conjunctiva, since posteriorly it stops at the surface of the cornea and sclera. At the anterior part of the sclera there is a layer of tissue between the neoplasm and the eyeball, so that a clean extirpation would have been impossible. In the posterior part of the preparation the superficial layer of the sclera is infiltrated. It is separated from the basis of the tumor by a space produced in preparing the specimen. At a very short distance from this space the tumor has pigment cells in it. The pigment is so dense in places that the individual cells are not easily recognizable.

So much for the inner and outer layers of the tumor; now for the parenchyma. By a small magnifying power ($\frac{1}{1}$) the principal mass is seen to consist of two lobes with a depression between them, and of two smaller nodules situated, the one at the anterior, the other at the posterior angle of the growth. At the posterior surface there is no line of division between the lobes except the direction taken by the spindle-shaped cells.

If we begin with the anterior lobe, next to the basis, which is rich in round pigment cells, there is a free layer of pigment cells which is bent, and presenting its convexity forward. The cells are spindle-shaped, with fine long offshoots and distinct nuclei. They are traversed by several layers of

unpigmented cells. The bent tract reaches to the surface of the tumor, runs along its top, and again bends down to form the division between the two principal divisions of the neoplasm.

On the free surface of the tumor, just beneath the epithelium, there is another thin layer of unpigmented connective tissue which is infiltrated with cells, varying in density in different parts. Just beneath the surface the pigment cells are darker, are either round or rod-like, and are colored dark-brown or brownish-black; their nuclei are sometimes invisible. From this darker layer of cells there are many fine tracts of spindle cells which run down into the substance of the tumor in an irregular manner, especially in the posterior and middle portions of the lobes. The anterior part is almost free from pigment, and has the structure of a spindle-cell sarcoma. The small spindle cells are compacted together, and run in lines, perpendicular or slightly bent, and these are separated by delicate pigmented spindle cells with long offshoots.

The structure of the two lobes is similar. Large blood-vessels are found, especially just beneath the surface, not beneath the epithelium, but below the cortical pigment layer. The structure of the smaller lobes is also the same, except that the cells are generally round or spindle-shaped, with long offshoots.

Other sections present peculiar conditions, although they do not give the entire character of the tumor. Just beneath the epithelium there is a cortical layer of pigment, made up of spindle cells, sometimes lying perpendicular and sometimes parallel to the surface. Beneath this is another layer of small, round cells, which have no pigment, and in this layer are melanotic nodules, several millimetres in breadth, so that the sarcomatous tissue, which is in itself free of pigment, has a network of dark pigmented cells running through it.

I will not try the patience of the reader by going any further into the shapes and arrangement of the cells, although it seems necessary that I should so describe this tumor (the first one I have seen) that any one who finds a

similar example may be in no doubt as to the character of this case.

Explanation of Figures (*Plates ii, iii, iv*).

Fig. 1.—Represents a section through the eye of Case 1 (glioma retinæ endophy.), natural size. The drawing was made after the eye had been several months in Müller's fluid and several in concentrated alcohol. It is therefore somewhat shrunken, so that the choroid is separated from the sclera and the retina detached from the choroid. 1. Cornea. 2. Sclera. 3. Sheath of optic nerve. 4. Opticus. 5. Choroid. 6. Part of retina not thickened. 7. Retinal tumor. 8. Shrunken vitreous.

Fig. 2.—Shows a thick section of the retina, to the inner side of which is an isolated nodule of the tumor 2.5 *mm.* broad and 5.5 *mm.* thick, drawn with Zeiss' Loupe, magnified $\frac{1}{1}^{0}$. *rr.* Retina. *u.* Place turned over by preparation. *t.* Tumor. The layers of the retina are distinctly seen by this low power. *p.* Pigment epithelium not well preserved. *b.* Stratum bacillosum. *ge.* Stratum granulosum externum. *gi.* Stratum granulosum internum. *o.* Layer of optic-nerve fibres (infiltrated). *n.* New-formed layer on the inner surface of the retina. *R.* Hypertrophied radiating fibres.

Fig. 3.—Shows a part of Fig. 2. Magnified $\frac{1}{1}^{0}{}^{0}$ (Schick obj. 1, 2, 3 oc. 1); the letters same as above. *a.* Amorphous exudation on the outer surface of the retina. *v.* Blood-vessel. *t.* Tissue of the tumor made up of round cells, with numerous vacuoles. t_1. Free surface of tumor, continuous with the hypertrophied radiating fibres. *TTT.* Tissue of the nodes. They could not be drawn further, since they have fallen out as at t, t_1.

Fig. 4.—Shows a microscopic perivascular patch of glioma cells in the layer of optic-nerve fibres. Hartnack obj. 5 oc. 4 $=\frac{2}{1}^{5}{}^{0}$. It lies in the neighborhood of a large nodule 10 *mm.* broad and 6 *mm.* thick. *n.* new-formed layer on the inner surface of the retina, connected with the layer of optic-nerve fibres by fibres, etc. In this lies the microscopic glioma patch, the middle of which is filled with red blood corpuscles. *gi.* Inner granular layer. *ge.* Outer granular layer. *b.* Rods and cones. *p.* Epithelium.

Fig. 5.—Is from the vicinity of Fig. 4, same enlargement, and shows a patch in the new-formed layer *n.* Letters the same as before.

Fig. 6.—Is from the free surface of the tumor toward the vitreous. Same enlargment as Fig. 4. The drawing is only completed on one side. 1. 1. 1. Free surface of tumor. 2. 2. 2. Glioma cells. 3. 3. 3. Degenerating patch in the gliomatous tissue.

Fig. 7.—Is from the vicinity of Fig. 6, and shows the limit of the gliomatous tissue toward the vitreous. Magnified same as Fig. 4. *v. v.* Vitreous body. *gl. gl.* Gliomatous tissue.

Fig. 8.—Shows a circular arrangement of glioma cells (same power).

Fig. 9 *a.*—Colored section of the eye of Case 2 (glioma ret. exophy. in 3d stage), natural size. 9 *b.* is the excised nerve stump.

Fig. 10.—Shows a section of Case 3 (sarcoma chor. et corp. cil.). Drawn with loupe of 2 inches focus and transmitted light.

Fig. 11.—Shows a part of this section where the pigmentation of Fig. 10 is visible (Hartnack 5+iv). We see the small-cell unpigmented sarcomatous tissue. The draughtsman has represented only the well-defined nuclei, and indicated only here and there the delicate outlines of the cells. The field is surrounded by fibrillar tissue with rod-like nuclei, in which we notice large yellow pigment cells.

Fig. 12.*—Shows a sketch of Case vi (melano-sarcoma præcorneale). *c.* Corneal margin. *p.* Pupilla. *T.* Tumor. *S.* Groove on same. f_1 and f_2. Wing-like extensions of the tumor along superior and inferior corneal margins.

Fig. 13.—Gives the appearance of the same under the microscope.

Fig. 14.—Same. Drawn with loupe of 2 inches focus and transmitted light. *c.* Cornea. *s.* Sclera. *l.* l_1. Space between tumor and eyeball. *e. e.* e_1. Epithelium. *t.* Tumor.

Fig. 15.—Shows the anterior end (*c. l.* e_1.) of Fig. 14, magnified $\frac{14}{1}$. *c.* Cornea. e_1. Epithelium of the cornea which runs over on to the tumor. *p.* Pigment cells. *l.* Space between cornea and tumor. λ. Space produced in tumor by preparation; on the edges of this space, both the pigment and unpigmented elements of the tumor are to be seen. *v.* Empty blood-vessels with distinct endothelium.

Fig. 16.—The basilar portions of the tumor magnified $\frac{14}{1}$. This is from the region of its attachment. It shows a place where there are small unpigmented cells, closely packed around a

* On the plate (tab. ii and iii) this figure is marked 13, and fig. 13 is marked 14.

blood-vessel (*v*) full of red blood corpuscles. Large club-shaped or spear-shaped pigment cells are scattered among them.

Fig. 17.—The central elements of the tumor (magnified $\frac{250}{1}$) where the pigmentation is not to be seen with the naked eye. Notice round and spindle-shaped cells free from pigment. These are arranged in rows, while between them we also see delicate spindle-shaped pigmented cells with long offshoots.

ON QUININE AMAUROSIS.

WITH A CASE.

By Dr. E. GRUENING, New York.

ALMOST every modern text-book on ophthalmology contains in its chapter on toxic amblyopia and amaurosis, some general remarks on the occurrence of blindness after an overdose of quinine. If we collect the recorded cases upon which these general statements are based, we find that the material is rather scant. By searching the literature, I have been able to bring together the following eleven cases:

1. Giacomini, 1841. *Annal. Univers. di Med.*, quoted by Binz, in the "Real-Encyclopædie der Gesammten Heilkunde." Edited by Dr. A. Eulenburg. Art., "Chinarinden."

2, 3, 4, 5. Briquet. Four cases of incomplete amaurosis, quoted by Binz (l.c.)

6, 7. Græfe. Two cases of quinine amaurosis. *Arch. f. Ophth.*, vol. iii, part 2, p. 396.

8. Voorhies. Temporary blindness from quinine. *Transactions of the American Medical Association*, 1879.

9. de Wecker. Ocular therapeutics. Translated by Litton Forbes, quoted by Roosa.

10, 11. Roosa. 1. Poisoning from the use of the compound tincture of cinchona; 2. Amblyopia from quinine (?). These Archives, Vol. viii, No. 3, and Vol. ix, No. 1.

The first case on the list, the case of Giacomini has never before been cited in ophthalmic literature. If a physiological experiment on man had been instituted with due

care and with the elimination of every possible source of error, it could not prove more conclusively than does this case, that temporary blindness may result from an overdose of quinine. The case is as follows:

A man, aged 45, suffering from constipation, took by mistake three drachms of sulphate of quinine at one dose, instead of cream of tartar. Within an hour he felt great pain in the head, stomachache, dizziness, general debility, and finally became unconscious. The face was pale; the lips and the extremities were livid and cold. The pulse was uniform, slow, hardly perceptible; the respiration sluggish. The pupils were very much dilated. When consciousness returned, sight and hearing had almost entirely vanished. The general prostration and the weakness of sight and hearing lasted a long time.

In some of the cases on our list the authors themselves were in doubt as to whether the disturbance of sight was really attributable to the action of quinine. Thus, Graefe says that in his cases some predisposing causes may have been present, *e. g.*, the condition of the blood in malaria, the accumulation of pigment granules within the cerebral vessels, etc., etc. Roosa publishes his second case of "quinine amblyopia (?)" with an interrogation point.

If I now record my case as one of quinine amaurosis, I do so because, in the first place, I can exclude other possible causative factors without strain, and because, in the second place, I find in the few well-observed and more minutely reported cases of quinine amaurosis a number of parallel, I may say pathognomonic, points which stamp this affection as one *sui generis.*

Mrs. ——, aged 35, was threatened with miscarriage at about the sixth week of gestation. There was a slight flow of odorless blood from the uterus for several days. The discharge then became fetid, and it was necessary to remove the contents of the uterus artificially. This procedure was attended with slight hemorrhage, and was followed by a considerable rise of temperature. The thermometer indicated 106° F. She was placed on a fever cot, and water at a temperature of 80° F. was poured over her. Sulphate of quinine was administered in ten-grain doses. Alto-

gether eighty grains were given within thirty hours. Shortly after having taken the last dose of quinine, Mrs.—— had a convulsive fit characterized by twitching of the facial muscles and jerking of the upper and lower extremities. Dr. Adler, who was in attendance at that time, states that she did not lose consciousness during the attack, as she replied rationally to questions addressed to her in a loud tone of voice. The patient denies all knowledge of the fit, and maintains that she was unconscious during the convulsive movements. When the attack had passed, Mrs.—— was found to be totally deaf and blind.

I saw the patient twenty-four hours later, on June 26, 1880, and she had then partially recovered her hearing, but was still totally blind. An examination of the eyes showed the pupils dilated ad maximum, and without either direct or consensual contraction. Accommodative contraction, however, was clearly demonstrable when the patient was caused to make a strong convergent effort. The refractive media clear in both eyes. The optic discs were very pale but transparent, and their outlines well defined. The retinal vessels, both arteries and veins, so attenuated, that, in the inverted image, they could scarcely be perceived. In the upright image the vessels were distinguishable as continuous, exceedingly narrow bands, tapering into fine points somewhat abruptly. The slightest pressure upon the eyeball sufficed to render all the retinal vessels absolutely bloodless. At the macula of each eye, there was a cherry-colored spot, surrounded by a zone of bluish-gray opacity. Tn. The corneæ were not anæsthetic (case of Voorhies). The blindness was absolute. The bright light of an Argand lamp, concentrated upon the eye by means of a convex lens, was not perceived. No phosphenes by pressure. No specific reaction of the optic nerve by the galvanic current. Temp., 110½°. Pulse, 120; very feeble.

The patient was exceedingly pale, and was perfectly rational at the time of the examination. She complained of no pain, and requested me to speak in a louder voice, as the constant noise in her head interfered with her hearing. She heard my watch in contact with the auricle. The tympanic membranes were not injected. The urine contained no albumen.

I was guarded in my prognosis, stating that if the blindness depended upon the action of quinine, as I thought it did, sight would most probably be restored, there being no case of permanent blindness from quinine on record. Inasmuch as the palpa-

ble cause of blindness was found in the retinal ischæmia, the therapeutic agents were necessarily directed toward the reëstablishment of retinal circulation. A generous diet, a recumbent position (the head on a level with the body), instillations of a one-per-cent. solution of sulphate of eserine, inhalations of nitrite of amyl, together with the administration of digitalis, were among the measures employed by Drs. Adler and Hoffman, the attending physicians. Under the influence of eserine, the pupils became contracted and remained so for about three hours after each instillation. Dilatation, following the contraction, never reached as high a degree as previously, the pupils remaining fixed in a state of moderate dilatation.

On July 5th, eight days after the supervention of the blindness, Dr. H. Knapp examined the patient and agreed with me in considering her case one of quinine amaurosis. At that time the opthalmoscopic condition had changed somewhat, the circummacular retinal opacity and the cherry-colored spot at the macula having disappeared. The optic discs and the retinal vessels had undergone no change. The pupils were moderately dilated (the eserine having been discontinued for twenty-four hours) and fixed, except with efforts of convergence, when a slight contraction was noticeable.

On July 19th the patient could discern the position of the window in the room. Upon examination, it was found that she had quantitative perception of light in both eyes. The next day I was chagrined to discover that the perception of light had disappeared, and upon inquiry learned that the patient had been sitting up for three successive hours. I enjoined upon her the necessity of lying quietly upon her back, with her head below the level of her body, if possible. On July 22d perception of light had returned. A few days later she menstruated, and during that period again lost the quantitative perception of light. This she regained after the lapse of a few days, and in the following weeks her sight improved considerably, so that on August 16th, about seven weeks after the attack, she could see to count fingers with either eye at a distance of four feet.

At the next menstrual period her sight diminished somewhat, but after that time improved steadily. On August 30th she read the ordinary type of the *Gartenlaube* with +3D, her hypermetropia being 3D. The letters, however, appeared white to her on a black ground. She was totally color-blind, and said that objects

appeared to her as if photographed. On September 23d she came to my office, and I then made a thorough examination of her eyes. The pupils moderately dilated (no eserine), without any direct or consensual reaction, but contracting with accommodative efforts. Refractive media clear. The optic discs still very pale but transparent. The retinal vessels, both veins and arteries, filiform. With +3D her sight is $\frac{20}{30}$, and she reads Snellen $1\frac{1}{2}$, with either eye. Her fields of vision are concentrically limited. The visual field of the right eye measures 30° on the temporal side, but does not extend to 20° in any other direction. The field of vision of the left eye is still more contracted, extending to about 18° on the temporal side, and not reaching that extent in the other directions. The annexed figures represent her visual fields at that time.

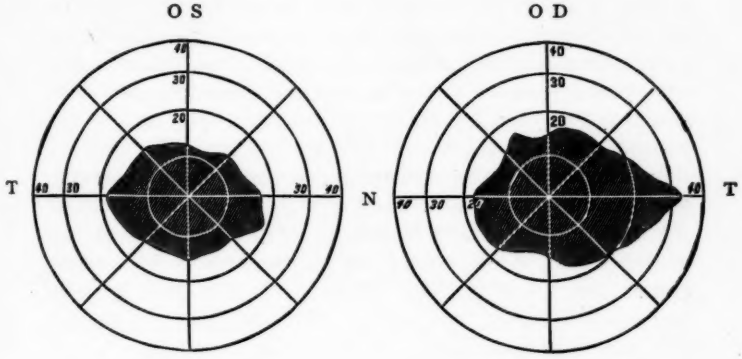


FIG. 2. FIG. 1.

On Snellen's color-chart she recognizes no color. All the letters appear gray to her, but the yellow letters are much lighter than the others. In the spectroscope she sees only a number of gray stripes of different shades. On November 8th I again examined her, and found her fields of vision slightly enlarged and her color-sense improved. On Snellen's chart she calls the red brown, the yellow yellow, the green gray, the blue blue, the gray gray. In the spectroscope she sees the spectrum of the sky yellow and blue. At the last examination which I made, December 28, 1880, the color-perception had still further improved, and she was able to distinguish the four fundamental colors: yellow, blue, red and green, the two latter, however, only when presented in large sur-

faces. The chromatic sense, therefore, was not yet perfect. Fields of vision, as found at that date, are represented below. With the exception of a slight reaction in the still moderately dilated pupils, there was no change in the eyes.

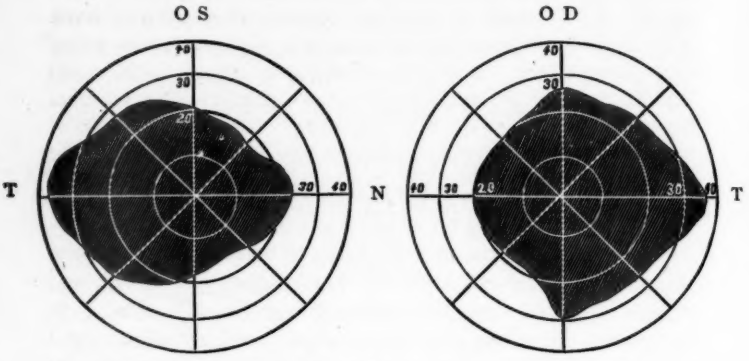


FIG. 4. FIG. 3.

In considering the various etiological factors that may have produced the sudden and total blindness in our case, we should, in the very beginning, exclude all causal elements known to bring on temporary amaurosis without appreciable retinal lesions. Thus we can eliminate hysteria and anæsthesia of the retina. In both these conditions the ophthalmoscope shows either a normal or a slightly hyperæmic fundus.

We cannot confound the ischæmia observed in our case, with the similar, but by no means identical ophthalmoscopic appearance in either embolism of the central retinal artery or apoplexy of the optic nerve (Magnus).

Nor shall we mistake our case for the amaurosis occurring after abortion, sudden and violent perturbations of the uterine functions, and hemorrhage after miscarriage. In a monograph entitled "Contributions to the knowledge of amblyopia and amaurosis following hemorrhage," by Sigmund Fries (*Klin. Monatsbl. f. Augenheilk.*, 1876, Beilage), one hundred and six pertinent cases are considered. In none of these cases, so far as the ophthalmoscopic examina-

tions are recorded, did the fundus present what we had found in our case, *i. e.*, a pure ischæmia of both retinal arteries and veins without any inflammatory changes whatsoever. In their onset as well as in their course did the cases collected by Fries materially differ from ours. For, neither has the concurrence of sudden deafness with sudden blindness ever been observed as a result of severe hemorrhage, nor is there a case of amaurosis from profuse metrorrhagia on record, in which restitution of normal central vision occurred.

We need not enter upon the consideration of uræmia as a causal element. Albumen was never present in the urine, and there were no symptoms pointing to the kidneys.

There remains still one condition to be discussed, namely, retrobulbar neuritis. It is well known that von Graefe and others observed cases of sudden blindness supervening in the course of infectious febrile diseases, such as measles and typhoid fever. Here the ophthalmoscope revealed either a slight inflammatory swelling at the optic-nerve entrance or a pure ischæmia of the retinal arteries only, with a normal or even congested condition of the retinal veins. The pathological process giving rise to the last-mentioned ophthalmoscopic appearances is said to be a circumscribed, symmetrical retrobulbar optic neuritis. The sudden occurrence of this localized bilateral optic neuritis is certainly problematic. Be this as it may, in our case we could not assume the existence of any inflammatory change in the optic nerves. The discs were transparent, their outlines well defined. The circummacular film, seen in our case, is not considered to be of inflammatory origin.

Thus, we have eliminated hysteria, retinal anæsthesia, embolism of the central retinal artery, apoplexy of the optic nerve (Magnus), amaurosis following hemorrhage, uræmia and retrobulbar neuritis as affections differing from quinine amaurosis in their onset, course, termination and ophthalmoscopic appearance.

On reviewing the unequivocal cases of quinine poisoning with amaurosis (ROOSA, WECKER, VOORHIES, GRUENING), *we find a remarkable congruence in their essential features.*

The patient, after the ingestion of a single dose or of repeated doses of quinine in varying quantities, suddenly becomes totally blind and deaf. While the deafness disappears within 24 hours, the blindness remains permanent as regards peripheric vision, central vision gradually returning to the normal after some days, weeks or months. The ophthalmoscope reveals an ischæmia of the retinal arteries and veins without any inflammatory changes.

In view of the constancy of these symptoms and the uniformity of the ophthalmoscopic picture, we are entitled to demand for this distinct type of amaurosis a recognized position in the pathology of the optic nerve and the retina.

CONTRIBUTIONS TO THE KNOWLEDGE OF THE CONGENITAL DISPLACEMENT OF THE LENS.

By Dr. F. E. D'OENCH, of St. Louis, Mo.

A CASE of congenital displacement of the lens having come under my observation while at the University of Strassburg, I have endeavored to collect the cases hitherto published, in order to see what conclusions might be drawn from such statistics. The following was my own case:

Marie P., 8 years old, was said to have had defective sight from her earliest childhood. The eyes of her parents were normal, also those of her four brothers and sisters. The anterior chamber was deeper toward the inner angle of the eye; the iris, of a grayish-blue color, trembled perceptibly in its lower half. The cornea was normal, also the globe. By means of oblique illumination, a dislocation of the lens could easily be detected, in the right eye outward and slightly upward, in the left eye almost exactly outward; no trembling was noticeable. Its edge was visible in shape of a bright, silvery crescent, dividing the pupil about in the middle. When examined with the ophthalmoscope, the equator of the lens was seen as a black, curved line; the lens itself was perfectly transparent and of normal size. The fundus appeared double, but presented nothing abnormal. After the instillation of a drop of atropine, a number of thin, bright threads became visible, parallel to each other, which sprung from the lens and disappeared behind the inner segment of the iris; a strong magnifier made this still clearer. The whole number of threads was about 80-100; they undoubtedly corresponded to the folds of the suspensory ligament.

Patient could read Jaeger No. 3 (V was the same in both eyes), holding the book so near her face that it almost touched the nose. V = $\frac{1}{100}$, with + 9D = $\frac{20}{70}$; concave glasses impaired her sight. There was no power of accommodation. Tn; there was no cause for assuming liquefaction of the vitreous. There was no diplopia; if, however, a red glass was held before the eye in such a way that it covered the inner half of the pupil, the other eye, of course, being closed, two images were seen, but no information could be obtained as to their size, position, etc. She received convex glasses, and was dismissed.

Up to the time of Sichel, the spontaneous dislocation of the lens was almost entirely unknown; a few cases in literature might be classed as such, but no attention was paid to them. Sichel was the first to separate the spontaneous from the traumatic dislocation; in his publication in Oppenheim's "*Zeitschrift für die gesammte Medicin*," 1846, he describes eleven cases of "dislocation and sinking of the lens," eight of which he observed himself; in every case, cataract had formed, and the dislocation took place in a downward direction.

Sippell was the first to make a distinction between congenital displacement and spontaneous dislocation. Some symptoms are common to both, but they differ in their cause and demeanor during life. He arrived at the following conclusions:

1. Spontaneous dislocation and congenital displacement of the lens are two very different conditions: the former is the result of a diseased process in the eye; the latter, a malformation.

2. It is almost certain that congenital displacement is hereditary.

3. Iridodonesis is common to both conditions, also diplopia and shortsightedness combined with hyperopia, which latter condition may be modified, however, by a high degree of sclerectasia myopum.

4. As spontaneous dislocation and congenital displacement always affect both eyes, though not always symmetrically, I would recommend a closer study of the simultaneous development of both eyes from their earliest embryological

state. According to him, spontaneous dislocation may be distinguished most readily from congenital displacement by being a continually advancing process, ending with the complete sinking of the lens, whereas the latter condition is a permanent one, as the lens remains in the same position; he thinks that perhaps all sideward or upward dislocations may be regarded as congenital. This division has been pretty generally accepted; with certain modifications it seems to me also to be the correct view. Sippell's assumption, however, that the displacement remains permanent throughout life, has become doubtful, ectopia being considered one of the principal causes of spontaneous dislocation.

The etiology of ectopia is thus far entirely unknown; most explanations refer only to spontaneous dislocation (Raab), and but very few to ectopia; they are the following:

A. v. Graefe, who first described several cases with greater accuracy, but did not distinguish them from spontaneous dislocation, assumes a gradual destruction of the suspensory ligament, combined with liquefaction of the vitreous, to be the cause of dislocation; the direction might be determined by the movements of the eye, external pressure, etc. This explanation evidently refers only to spontaneous dislocation. Sippell, who considers ectopia a malformation, thinks that with this exception the eye may be entirely normal, and is even inclined to assume a position of the fovea centralis corresponding to the displacement, which, however, he thinks it would be difficult to prove. E. Jaeger assumes that in his case the malformation might be explained in this way: that the attachment of the lens in its lower half may have been loosened by the same agency which caused the cataract (there was cataracta corticalis congenita in his case), whereupon the lens was dislocated upward through the tension of the remaining attachments. This explanation could only be applied to a few cases, for, as a rule, the lenses remain clear. Stellwag thinks that an imperfect development of the suspensory ligament, in that part where formerly the foetal fissure was

situated, bears an important relation to the ectopia, because in many cases of coloboma oculi malformations of the suspensory ligament were also found; irregular development of the lens also might have some influence. Becker attributes ectopia to irregular development of the suspensory ligament, though no explanation can be offered for this hypothesis. As in most cases the displacement is directly upward, it may be brought into connection with the foetal fissure of the eye. Schirmer lays particular stress on the smallness of the lenses, which alone could explain the displacement. The lens, having been checked in its growth, exerts a continually increasing strain on the suspensory ligament, so that finally it tears, and then dislocation ensues. He justly attaches no importance to liquefaction of the vitreous. The objection to this explanation is that in only a few cases the lenses are smaller than the average. Klein thinks that ectopia is due to the entire absence of the usual means of attachments; it is characterized by the complete want of the suspensory ligament in consequence of a malformation, a view which is certainly too restricted and at variance with those cases in which the presence of the suspensory ligament could not be doubted. Duval thinks that the ectopia may perhaps be explained by the development of the lenses in an abnormal position, a hypothesis not at all improbable, though no facts can yet be brought to its support.

Heredity, as v. Graefe first, and Sippell, Dixon, Morton and others afterward showed, is not infrequent. The most remarkable cases were those of Morton, where ectopia could be traced through five generations. It seems also to affect men about twice as often as women. No statements are made in regard to relationship of the parents. The relative frequency of ectopia is very small; among fifty thousand cases of diseases of the eye, observed by Knapp, there were only ten of ectopia, *i. e.*, 1:5000, or $\frac{1}{50}$ per cent.*

The symptoms of ectopia vary considerably. When no other abnormity but a slight degree of dislocation exists, they

* These numbers are compiled from the case-books of Dr. Knapp's private and hospital practice in New York, which he kindly placed at my disposal.

may be entirely wanting, and myopia, a not infrequent condition, the only cause for complaint. In higher degrees of displacement, monocular diplopia is sometimes noticed, though frequently absent. This may be attributed to the greater distinctness of one of the two images, or the patients may learn to neglect one of them. Knapp, however, observed a case in which all four images were perceived simultaneously. In most cases it should be possible to produce diplopia, for instance by covering that part of the pupil occupied by the lens with a red glass, while the aphakic part remains free, and then telling the patient to look at a light, the other eye being closed; if the amblyopia is not too great, there should be diplopia. When the lens is entirely or almost entirely dislocated beyond the margin of the pupil, the condition is the same as that in aphakia, and sight is greatly impaired.

Of the objective symptoms, iridodonesis is the most noticeable; it is scarcely ever wanting (in only two cases, of Bowman and Macnaughton Jones, the absence of tremulousness is expressly mentioned). It is most readily seen in that part of the iris which does not touch the lens, especially when the eye moves. Streatfeild mentions a "dancing before the eyes," which he ascribes to iridodonesis; but this cannot be the cause, otherwise the phenomenon would have been observed more frequently. The anterior chamber is of unequal depth, showing a bulging in that part of the iris behind which the lens is situated; this symptom, however, may be wanting.

The diagnosis is made most readily by using oblique light and the ophthalmoscope. In the former case the edge of the lens becomes visible in the form of a bright line, and sometimes the lens itself as a grayish body, easily distinguishable from the black aphakic part of the pupil. When examined with the ophthalmoscope the edge of the lens is seen as a black line, in consequence of total refraction; the fundus appears double.

The power of vision depends mainly on the degree of displacement and the transparency of the lenses. It can almost equal the normal, when the degree of displacement is

not great, and the myopia, which is often found, is corrected. In higher degrees convex glasses are found more serviceable, so that sight is sufficient for all ordinary purposes. Sometimes, however, both convex and concave glasses prove useless, the reason for which may perhaps be sought in a torpor of the retina, caused by the indistinctness and interference of the images. As regards accommodation, Sippell mentions that he found a very slight degree of it.

In the majority of cases the lenses remain clear; assuming that to be the case also where nothing is said in regard to their transparency, as may fairly be done, they are clear in about 75 per cent. of all cases; of the remaining 25 per cent., only about one-half show opacities, mostly slight in both eyes. As regards the direction of the displacement, in fifty-two cases where it was mentioned, it was directly upward and inward in eighteen cases, almost as often (sixteen times) upward, and about one-third as often (five times) upward and outward; there were but few in a horizontal direction, inward and downward or outward and downward; *none* directly downward. In general, therefore, displacements below the horizontal are open to doubt (except in cases of corectopia). In a number of cases nothing is said in regard to the direction of the displacement. Almost always the ectopia is symmetrical in both eyes, though not entirely so; the exceptions are mostly due to corectopia. In a few cases there seems to have been a slight revolution about the vertical axis, in others about the horizontal. In ten cases the size of the lens was below the mean; this may partly be due to checked growth, partly to the lessened tension of the suspensory ligament, which being unequal to the elasticity of the lens, the thickness of the latter increases while the equatorial diameter is diminished; perhaps the myopia which is found in about one-fourth of the whole nnmber of cases may partially be due to this. Very little attention has been paid to the suspensory ligament. A. v. Graefe thought he saw it, though he was not sure of it, and Stanford Morton, in most of the cases described by him, in the shape of fine striæ radiating

from the lens. In six cases its absence is mentioned; in all the others nothing is said about it.

Sometimes ectopia is complicated with other malformations, especially with corectopia. There are no less than eleven cases among those I have collected, in which there was corectopia, combined with ectopia of the lens in both eyes, while in six others ectopia was probable, so that almost every third case of congenital displacement would be complicated in this way. The case of Alexander is remarkable because the lens was displaced in only one eye, while there was corectopia in both eyes; this would be the only case of one-sided ectopia. The lens is displaced in a direction opposite to that of the pupil, indicating a connection between the two conditions which has not yet been explained.

In three cases (those of Klein, Knapp, Hjort) there was irideremia, combined, in that of Knapp, with nystagmus and posterior polar and equatorial cataract; in that of Klein, with nystagmus alone.

The fundus, when examined, was normal, with but few slight exceptions; in a number of cases there was a staphyloma posticum. The cornea, iris (except in cases of corectopia), sclera, eyelids, etc., were normal.

The displaced lenses may remain in the same position throughout life; this, however, can only be determined by repeated examinations, which will be but rarely possible, as the patients are generally lost sight of. A few years ago Raab has drawn attention to the fact that ectopia is one of the most frequent causes of spontaneous dislocation, such eyes being constantly threatened in that way. A number of cases have been observed where both ectopia and spontaneous dislocation were found in the same generation, making it almost certain that the latter condition is frequently the result of the former. In three cases glaucoma was observed; but it is doubtful whether any connection can be found between it and the ectopia.

Another danger threatening such eyes is detachment of the retina. High degrees of myopia, which are not infrequent in ectopia, often lead to this result; Williams

mentions such a case, saying that it is not a rare occurrence; but I could not find another example of it.

The treatment will mainly depend on the degree of displacement and the condition of the lenses. In low degrees and when the lenses are transparent, a correction of the myopia, if there is any, will suffice to give the patient good sight, while in higher degrees, convex glasses will generally prove the best. Operations have also been resorted to.

Wecker twice performed iridodesis in such a manner as to cover the lens. The dangers attending this operation, however, do not make it advisable. Streatfeild performed iridectomy of that part of the iris opposite the lens; he cut out a narrow section, but left the periphery behind. A. v. Graefe also performed this operation in four cases of spontaneous dislocation (which may have been ectopias), twice with good result; but he thinks it advisable only when the lenses are clouded. Wecker (*Chirurgie oculaire*, Paris, 1879, p. 120), has advised to perform iridotomy in such cases; he claims for this method greater ease of execution and less danger. Extraction has also been resorted to. Mooren practised division once with good result.

From the above the following conclusions may be drawn:

1. Ectopia of the lens is a malformation, the causes of which, thus far, remain unknown.
2. It always affects both eyes, generally in a symmetrical manner.
3. The direction of the displacement is almost always either upward, upward and inward, or upward and outward.
4. The lenses are generally transparent; sometimes their size is below the mean.
5. The suspensory ligament is sometimes found, sometimes not.
6. In about one-fourth of all cases there is myopia.
7. The position of the lenses may remain unchanged throughout life, but spontaneous dislocation may also result.
8. Heredity has been proven.

BIBLIOGRAPHY.

ALEXANDER. *Zehender's Klinische Monatsblätter für Augenheilkunde*, 1874, p. 66.

ARLT. *Krankheiten des Auges*, Bd. ii, p. 272.

F. v. BECKER. *Nagel's Jahresbericht für* 1870, p. 224.

BOWMAN. *Ophthalmic Hospital Reports*, vol. v, p. 3.

E. BREITBARTH. "Beiträge zur Kenatniss der Ectopia pupillæ," Inaug.-Dissertation, Giessen, 1878.

BRESGEN. *Centralblatt für pract. Augenheilkunde*, p. 104, 1879.

DIXON. *Ophthalm. Hospital Reports*, vol. i, p. 54, and vol. i, p. 109.

DUFOUR. *Bulletin de la Société Méd. de la Suisse Romande*, No. 5, 1869.

FERD. DUVAL. "Quelques considérations sur les luxations spontanées et les luxations congénitales du cristallin." *Thèse de Paris*, 1874.

M. FOLLIN. *Gazette des Hôpitaux*, 1866.

A. v. GRAEFE. *Arch. f. Ophthalm.*, Bd. i, p. 255, and Bd. i, 1, p. 345.

J. HJORT. *Nagel's Jahresbericht für* 1873, p. 211.

E. JAEGER. *Ueber Staar und Staaroperationen*. Wien, 1854, p. 57.

J. S. JEAFFRESON. *Ophthalm. Hospital Reports*, vol. viii, p. 186.

MACNAUGHTON JONES. *Dublin Journal of Med. Science*, February, 1879.

L. KLEIN. *Zehender's Klin. Monatsblätter für Augenheilkunde*, März, 1877, p. 21.

H. KNAPP. *Graefe's Arch. f. Ophthalm.*, Bd. viii, 2, p. 231 (No. 9).

L. MANDELSTAMM. *Zehender's Klin. Monatsblätter für Augenheilkunde*, März, 1878.

MOOREN. *Ophthalmiatrische Beobachtungen*, Berlin, 1867, p. 122.

A. STANFORD MORTON. *Ophthalm. Hospital Reports*, vol. ix, 3, p. 435.

J. B. ROBERTS. *Philadelphia Med. Times*, January, 1881.

SANTISSON. *Schmidt's Jahrbücher der gesammten Medicin*, 1875, No. 171, p. 190.

SCHIRMER. *Greifswalder Med. Beiträge*, 1863, Bd. i, p. 77.

SIPPELL. "Die spontane Luxation der Linse und ihre angeborne Ectopie." Inaug.-Diss., Marburg, 1859.

STELLWAG. *Wochenblatt der Zeitschrift der k. k. Gesellschaft der Aerzte zu Wien*, December, 1856.

STREATFEILD. *Ophthalm. Hospital Reports*, vol. viii, p. 383.

TALKO. "Beiträge zur Lehre der traumatischen und vorzüglich der spontanen Dislocation des Linsensystems." Kiew, 1874, pp. 1–81.

WECKER. *Annales d'Oculistique*, vol. xlix, p. 159.

G. WELLS. "Treatise on the Diseases of the Eye."

E. WILLIAMS. *Transactions of the American Ophthalm. Society*, 1876.

My case.

DOUBTFUL CASES OF ECTOPIA.

F. DUVAL. "Quelques considérations sur les luxations spontanées et les luxations congénitales du cristallin." *Thèse de Paris*, 1874, p. 18.

A. v. GRAEFE. *Arch f. Ophthalm.*, Bd. i. 1, p. 250.

P. D. KEYSER. *Philadelphia Med. and Surg. Reporter*, January, 1874.

NOEGGERATH. *Oppenheim's Zeitschrift für die gesammte Medicin*, 1846.

F. RAAB. *Arch. f. Ophthalm.*, Bd. xxi, 1, p. 190.

B. RITTER. *Rottenburger Journal der Chirurgie und Augenheilkunde*, Ph. v. Walter u. Fr. v. Ammon, Bd. xxxii; *Neue Folge*, Bd. ii, p. 404. Berlin, 1843.

SCHWARZ. *Schmidt's Jahrbücher der gesammten Medicin*, 1843, Bd. xxxvii, p. 327.

SCLEROTOMY FOR SIMPLE GLAUCOMA IN ONE EYE, FOR HEMORRHAGIC GLAUCOMA IN THE OTHER. KIND HEALING IN THE FORMER, PANOPHTHALMITIS IN THE LATTER. DEATH.

By H. KNAPP.

THE following case seems worthy of publication, both for its bearing on the prognosis and operative treatment of hemorrhagic glaucoma. Hemorrhagic glaucoma, being generally recognized as the most unmanageable form of glaucoma, and iridectomy being almost always useless for it, I tried sclerotomy, which was not only unsuccessful, but fatal.

February 4, 1881, Mr. J. M., æt. 74, of Elizabeth, N. J., presented himself at my office. He seemed to be in tolerably good health, and did not appear very decrepit. The sight in his left eye had gradually declined for about a year; that in the right, five months, but more rapidly of late. The external appearance of both eyes showed nothing abnormal. The corneæ were clear; the depth of the anterior chambers was undiminished; both pupils were round, small, and perfectly movable. The tension in both eyes was increased ($+T_1$). S.R.$=\frac{1}{20}\frac{5}{0}$, L.$=\frac{1}{20}\frac{8}{0}$. F. contracted in both; its limits difficult to determine. Deep excavations of both discs; in the right eye numerous retinal hemorrhages.

I ordered him a solution of eserine (0.05 : 10.00), and advised him to have his eyes operated on if they should get worse. His sight failing rapidly, he came to be operated on, February 25th. The external appearance and tension had not changed. The interior was not examined. Eserine was instilled into his eyes, but the pupils did not contract. Under deep ether-narcosis I made a

sclerotomy first on the right, then on the left eye. That on the right was large and peripheric, but perfectly correct and without any bruising of iris or other accident, for all the time, during and after the operation, the pupil had remained round and central. In the left eye the escaping aqueous puffed the conjunctiva up, which, therefore, was snipped ; no other accident occurred. This eye recovered without any irritation ; not so the right.

Several hours after the operation, he felt nauseated, and had great pain all night. The lint next morning was found moist and covered with muco-pus along the palpebral fissure. The edge of the upper lid was œdematous, the conjunctiva chemosed, the wound of counterpuncture raised and covered with stringy mucus. The anterior chamber was turbid, the pupil brownish, the iris dull. From the next day regular panophthalmitis set in, the cornea sloughed, the lens was expelled on the fifth day. The patient's general health was tolerable from the second to the sixth day, when, after a restless night, he was greatly collapsed. His answers were slow, and he was so apathetic that I thought he might have had a cerebral capillary hemorrhage. He rallied, however, quickly. The swelling of lids and conjunctiva was very moderate. There being no great pain in his eye and no exophthalmus or swelling of the eyeball, the suppuration not having invaded the choroid, I let him return to his home on March 4th, where he died on the 6th.

What the immediate cause of so unexpected an event as a suppuration after a correctly executed sclerotomy was, I am unable to tell. Perhaps a copious intraöcular hemorrhage from the operation. The brownish color of the pupil seen the next day, seems to strengthen this supposition. An ophthalmoscopic examination, which might have demonstrated the hemorrhage, was not made.

A SMALL FOREIGN BODY IN THE POSTERIOR CORTEX OF THE LENS, SUCCESSFULLY REMOVED.

By H. KNAPP.

In September, 1880, I examined the right eye of George Rogner, a working man of 21 years of age, who, during my absence in August, had presented himself for the first time at my clinic, and whose disease had been recorded as cataracta mollis. He said that the sight of that eye had been gradually failing for six months without pain or inflammation. Finding the other eye quite normal, I enquired whether he had injured his eye, or knew any cause for the impairment of sight. He said he was unconscious of anything that had ever happened to his eyes. Apart from an almost mature soft cataract and the correspondent diminution of vision, I found the eye normal in every respect. Examining the lens closely, I noticed in the lower-inner part of the posterior corticalis a dark brown point, the apparent size of a pin-head. Its centre was completely black, its outlines ill defined. Though I could detect no metallic lustre at the dark spot, nor any irregularity in the capsule, or in the semi-opaque substance of the lens, I gave it as my opinion that the cataract was traumatic, and the dark spot, in all probability, a small particle of iron. On further enquiry, the patient said that eight or nine months previously, while hammering a piece of iron he had felt as if something struck his eye, but having had no pain and his sight remaining good until some months after it, he thought that his eye was not injured. Upon closer examination of the cornea, I saw a very small circumscribed opacity, about a line below and a little inward from the centre of the pupil, but no rupture or scar in the lens-capsule.

The presence of a foreign body in the lens now being almost certain, I thought it best to remove it with the cataract in a manner like that which A. v. Graefe* had followed in a similar case. An immediate extraction seemed unadvisable, as the cataract was not fully mature, and the foreign body, enveloped in a piece of tenacious cortex, might remain in the eye. Letting the eye alone until the cataract was ripe was not the safest procedure either, as the foreign body might make its way through the posterior capsule and fall into the vitreous, an occurrence which I have witnessed at the New York Ophthalmic and Aural Institute, in a case under the care of Dr. Pooley, who subsequently had to enucleate the eye.

With a view to remove the lens and foreign body by linear extraction, with preservation, if possible, of a round pupil, I made a small horizontal slit into the centre of the anterior capsule, October 28, 1880. My intention was in this way to mature the cataract, and at the same time to cause the foreign body gradually to advance toward the capsular opening. In December, the operation was repeated, the horizontal incision in the capsule was enlarged, and above it a vertical one was made, joining the horizontal in the centre. Both operations were followed by moderate reaction. The absorption of the lens was slow, yet the cataract became mature and the foreign body had moved somewhat toward the centre of the pupil.

On January 25, '81, I thought it safe to perform the extraction of the lens. Having Hirschberg's electro-magnet (which is very powerful) in readiness and etherized the patient, I made with a Graefe's knife a linear corneal section, the extremities of which were near the corneal margin and about 1 *mm.* above the horizontal meridian, whereas its apex was from 2 to 3 *mm.* below the upper corneal margin. The cataract presented as soon as the section was completed. I therefore pressed the upper wound-lip gently back with a flat, large spoon, and pressed with a hard-rubber spoon on the lower part of the cornea, directly toward the centre of the globe. This made the wound widely gape, and the whole lens, with the dark spot and every particle of cortex, came out together. After the lids had been closed for a minute, the pupil was clear and round, and no iris in the section. A drop of eserine was instilled and the eye bandaged. The next two days the anterior chamber was found restored, but the iris agglutinated

* His *Archiv*, ii, 1, p. 229. See also my paper on the "Removal of Foreign Bodies from the Interior of the Eye." These ARCHIVES, vii, p. 317, *et seq.*

to the corneal scar in its whole length. Atropine was instilled, and on the fourth day the anterior synechia had disappeared; the pupil was round and clear. Patient discharged, ten days after the operation, cured. At the end of February the pupil was round, central, and perfectly clear, the anterior capsule having completely withdrawn from the papillary area, yet, on ophthalmoscopic examination, the fundus was slightly veiled from wrinkling of the posterior capsule, and the vision was only $\frac{20}{50}$.

The operative procedure appeared safe, was followed by the best success obtainable, and deserves, I believe, to be recommended for similar occasions.

The foreign body was a minute metallic body, 1 *mm.* long, of steel or iron, for it was attracted by the magnet. The lens substance surrounding it was stained with rust.

NOTE TO THE COMMUNICATION ON "OPHTHALMOSCOPIC CHANGES FROM CONCUSSION OF THE RETINA."

(*Published in vol.* ix, *p.* 297 *of these* ARCHIVES.*)

BY H. KNAPP.

When, last summer, in the mountains, I extracted the above communication from my case-book, I did not recollect that this rarely observed condition had been described by several authors, namely, first, by Dr. R. Berlin, in an exceedingly instructive paper on "Commotio Retinæ," *Zeh. Klin. Mon.*, 1873, pp. 47–78; further, by Prof. Th. Leber in his treatise on the "Diseases of the Retina and Optic Nerve," in *Graefe-Sæmisch's Handbuch*, vol. v, p. 747, and by Prof. J. Hirschberg, in *Berl. Klin. Woch.*, 1875, No. 22. I am not aware that Dr. Berlin, as he promised, or some one else, has further studied this interesting subject.

New York, Febr. 15, 1881.

*On page 298, the words "in the inverted image," immediately under the drawing, ought to be cancelled.—K.

ABSTRACT OF AMERICAN OPHTHALMOLOGICAL LITERATURE DURING THE LAST QUARTER OF THE YEAR 1880.

By Dr. SWAN M. BURNETT, Washington.

1. Wm. S. Dennett. Report of the **examination** of the eyes of the **pupils** in the schools of Hyde Park. Hyde Park, 1880.

1,133 scholars were examined. Of these 76 per cent. had eyes which were considered perfect. Of the remaining, 12 per cent. were hyperopic : 8 per cent. near-sighted, and 4 per cent. had other troubles than anomalies of refraction. Among the pupils under ten years of age, only 18 per cent. had any anomaly, while in the advanced classes (over fifteen years of age) a perfect pair of eyes was the exception rather than the rule. Myopia increased from 3 per cent. in those from five to ten years of age to 30 per cent. among those between 15 and 20. There were fifteen cases of color-blindness.

2. Swan M. Burnett. On **optico-ciliary neurotomy,** with a case. *Phila. Med. Times*, August 14, 1880.

The cornea remained insensible for six months, after which time there was some return of sensitiveness, though there has been no manifestation of the sympathetic trouble for which the operation was performed.

3. Geo. Reuling. On the importance of **expectative surgery in certain injuries** of the eye by foreign bodies. *Southern Clinic*, October.

Case 1.—Bits of steel in the memb. of Descemet and iris. Case 2.—A bit of iron in the ciliary body behind the lens ; a fruitless attempt was made at removal. Case 3.—Powder grains in cornea, iris and lens. All the cases were treated antiphlogistically, and the threatening symptoms subsided.

4. Dr. Michel. **Effect of quinine on sight and hearing.** At a meeting of the St. Louis Medico-chirurgical Society, *St. Louis Courier of Med.*, November, 1880, M. reported the case of a man, 38 years of age, who, suffering from intermittent fever, took seven drachms of quinine in the course of twelve hours. Soon after he became suddenly blind. This was six months ago, and he was still blind. OS. showed the nerve to be pale ; veins thread-like, and arteries almost bloodless and scarcely perceptible.

Dr. Baumgarten reported a case of a boy who lost sight and hearing after taking what was estimated to be five drachms of quinia. He recovered in about six weeks.

Dr. SPENCER had noted an increase of vascularity of the *Mt.* and impaired hearing after the administration of large doses of the drug.

5. E. G. LORING. **An improved operation for a new pupil** after cataract operations. *N. Y. Med. Journ.*, November, 1880.

L. proposes instead of iridectomy and iritomy, a large, free and transverse section of the iris and all underlying membranes. He uses a very narrow-bladed knife, such as Graefe's or Liebrich's. After the eye is fixed in the ordinary method, the knife is entered at the sclero-corneal junction, but within the scleral ring, just as in the incision for cataract extraction ; the knife is then carried across the anterior chamber until the point arrives at the major circle of the iris. The section is then made by suddenly depressing the point of the knife until the handle becomes vertical.

6. P. D. KEYSER. **Homatropinum** Hydro-bromatum. *Phila. Med. Times*, November 6th.

From an experience of twenty cases, K. is convinced that homatropine is not so good a mydriatic as duboisia. It is more irritating and its action is less powerful. Its effect, however, passes off more rapidly.

7. W. W. SEELY. **Non-astringent caustic treatment of conjunctival inflammations.** *Cin. Lancet and Clinic*, November 20.

More than three years, Dr. Seely entered a protest against the astringent caustic treatment of trachoma, and he has since extended the application of his principle to all forms of conjunctival inflammations. He even thinks that atropia is harmful. He uses only yellow-oxide of mercury rubbed up in vaseline. Where there is corneal complication, he uses eserine in addition. He reconciles this plan with the modern antiseptic treatment, looking upon mercury as an antiseptic and anti-parasitic.

8. D. S. REYNOLDS. Clinical observations in ophthalmic practice. *N. Y. Med. Record*, December 4th.

1.—**Contusion of eyeball** by a shot, the shot remaining in the retro-tarsal fold for nearly a month. 2.—A boy had his **eye "gouged out"** in a fight. Retina was severed from the disc, but none of the vessels were ruptured. No p. l. 3.—Complete **detachment of the retina** caused **by a blow** from a fan. 4.—A **low degree of astigmatism** ($\frac{1}{12}$) corrected with complete relief to asthenopic symptoms.

9. E. C. MANN. **On the treatment of blindness and deafness resulting from cerebro-spinal meningitis,** by the constant current of electricity. *Med. Gazette*, December 4th.

Dr. Mann reports that he has obtained somewhat remarkable results from the use of the **constant current** in conjunction with hypodermic injection of nitrate of **strychnia** in such cases.

10. D. WEBSTER. **Amblyopia from abuse of tobacco and alcohol.** *N. Y. Med. Record*, December 11th.

W. formulates his conclusions from an examination of twenty cases as follows:

1. Amblyopia from poisoning by alcohol alone, or by alcohol and tobacco combined, is not uncommon.

2. Amblyopia from poisoning by tobacco alone *does occur*, but in this country somewhat rarely.

3. Cases of amblyopia from abuse of tobacco and alcohol will usually improve, perhaps to a limited extent, on simple abstinence from the poisons causing the disease.

4. They will improve much more rapidly under treatment by hypodermic injections of strychnia, this drug having a specific, stimulating influence on the nervous portion of the visual apparatus.

11. Wm. Thomson. **On color-blindness.** *Med. News and Abstract*, December, 1880.

T. has devised a method by which individuals can be tested for color-blindness by any one having no experience, in such a manner that the results obtained by any number of examiners will be comparable with each other. He has two narrow flat sticks hinged together at one end and fastened by a catch at the other, between which are forty buttons attached to one stick, numbered from 1 to 40, and capable of removal. To each button is attached a skein of worsted. The first 20 buttons have attached to them, on the odd numbers, various shades and tints of green, and on the even numbers the "confusion colors," grays, tans, light browns, etc. This first half is for the diagnosis of color-blindness. The second series, from 21 to 30, has the rose or purples on the odd numbers, the blues on the even; the third series, from 31 to 40, has alternately the red and the confusion colors for red, viz., browns, sages, and dark olives. An individual is placed before this and told to select from the instrument the colors corresponding to a green sample. If he is not color-blind he turns over the green skeins promptly. The clerk then records the numbers of the skeins thus turned over and they are recorded—all odd numbers. Examinations are then made with the purple and red, and the numbers of the skeins turned over likewise recorded. If there is any defect, the supervising officers to whom the report is sent can tell, from an examination of the numbers, the confusion tints, just as though he had made the examination himself.

12. W. C. Ayres. **Visual purple.** *N. Y. Med. Journ.*, December.

Dr. Ayres can speak authoritatively on the subject, since he assisted Kühne in all of his extensive experiments on the visual purple. The conclusion he has reached is that at least one office of the visual purple is to enable the eye to accustom itself to any circumstance, and by continual self-adjustment to keep itself fitted to work to the true advantage under all conditions.

13. B. J. Jeffries. **Removal of a piece of iron from the eye by the electro-magnet.** *Bost. M. & S. Journ.*, December 30th.

The piece of iron was deep in the cornea at the outer angle, and projecting into the ant. chamb. just behind the sclero-corneal juncture. There was no distinct tract through the cornea over the foreign body. It was decided to cut down on it on the corneal side, and attempt to keep it in place or from falling into the ant. chamb. by the near presence of the strong electro-magnet. On the approach of the magnet the foreign body was seen to move, and by applying it against the cornea the metal was drawn to it and removed.

14. J. S. Fernandez. **Amaurosis from lesions of the eyebrow or orbital region.** Translated by A. B. De Luna. *Amer. Journ. Med. Sci.*, January, 1881.

The details of five cases are recorded in this paper, the conclusions from which are as follows:

1. "Amaurosis following wounds of the eyebrow is generally the result of cerebral lesions, as proved by the fact that in the greater number of cases the patient loses consciousness or dies soon after the accident. 2. Although modern ophthalmological literature does not contain a single instance followed up from beginning to end by ophthalmoscopical examination, two of my cases and Galezowski's observations go to show that amaurosis is due to atrophy of the papilla, and this to a cerebral lesion of more or less severity, or to injury of the optic nerve in its passage through the optic foramen. 3. Those cases where amaurosis is attributed to sympathetic action or excitability of the fifth pair of nerves, from whatever cause, occurred previous to the employment of the ophthalmoscope, and were open to erroneous interpretations. 4. Amaurosis occasioned by simple irritation of the supra-orbital nerves from punctures, cicatricial distension, or any other cause, might, at the present time, be doubted in the absence of a single complete clinical record to support it; but inasmuch as sympathetic amaurosis from excitability of the maxillary branch of the fifth has been observed, the possibility of a similar result as regards the supra-orbital, one of the three principal branches of the trigeminus, cannot consistently be denied. 5. The entire identity between amaurosis from irritation of the superior maxillary and supra-orbital nerves once conceded, the prognosis must be considered equally favorable in either case; for amaurosis from wounds of the eyebrow resulting in atrophy of the papilla is incurable. 6. The experiments on dogs, inflicting divers traumatic lesions on the supra-orbital region, have not been followed by amaurosis."

15. S. D. Risley. The value of **homatropine** hydro-bromate in ophthalmic practice. *Am. Jour. Md. Sci.*, Jan.

R. has tried the new mydriatic in 44 cases, and draws the following conclusions from the results obtained:

1. "The homatropine hydro-bromate in solutions of 2, 4 and 6 grs. to ʒj is competent to paralyze the accommodation. 2. In from 16 to 30 hours this paralysis entirely disappears. 3. Dilatation of the pupil accompanies the paralysis and is more persistent, the probable duration being 48 hours. 4. It is no more liable to produce conjunctival irritation than atropia or duboisia. 5. It produces far less constitutional disturbance than either of the old mydriatics."

16. C. H. Williams. Notes of changes seen in the **eyes** of ten cases of **general paralysis of the insane.** *Bost. M. & S. Jour.*, Jan. 13th.

The commonest symptoms were small pupils, with slow and poor reaction to light. In four cases no changes were noted in the fundus. In four cases there were slight signs of atrophy of the disc. In two cases of short duration there were slight evidences of congestion about the discs.

17. H. W. Williams. Continued **toleration of foreign bodies** within the eyeball for fifteen and twenty-two years. *Bost. M. & S. Jour.*, Jan. 27, 1881.

Two cases are given.

18. J. B. Roberts. **Congenital dislocation** of both crystalline **lenses.** *Phila Med. Times*, Jan. 29.

The lenses in both eyes of a boy of 12 were dislocated in the usual position of congenital cases, upward and inward.

19. C. H. Carrier. A case of **choked disc.** *Phil. Med. Times*, Jan. 29th.

Patient had erysipelatous inflammation on the right side of the face. Death. On *post-mortem*, abscesses found in the brain, the inflammation having been carried from its original seat to the brain along the sheath of the inferior maxillary nerve through the foramen ovale. Sheath of o. n. healthy; no collection of serum in intervaginal space; no pus in the orbit.

20. Dr. OPPENHEIMER. **Foreign body** in the eye; **removal** by a **magnet**. O. presented a patient, at a recent meeting of the N. Y. Soc. of German Physicians (*N. Y. Med. Jour.*, Feb., 1881), from whom he had extracted a splinter of iron by Grüning's magnet. The splinter had penetrated 1 *mm* to the right of and below the corneal margin. An incision was made on the opposite side near the rect. int. and the magnet introduced. At the third introduction the splinter was drawn to the opening, whence it was easily removed. V—$\frac{20}{100}$ in good light.

21. F. C. HOTZ. The value of **homatropine** in ophthalmic practice. *Chicago Med. Jour. and Exam.*, Feb.

His experience with the drug has been favorable. He seldom uses a stronger solution than one-half per cent. for paralyzing accommodation.

REPORT ON THE PROGRESS OF OPHTHALMOLOGY FOR THE FIRST HALF OF THE YEAR 1880.

By Dr. H. MAGNUS, of Breslau, and Dr. A. NIEDEN, of Bochum.

Translated by Dr. R. O. Born, of New York.

ANATOMY, PHYSIOLOGY AND THERAPEUTICS.

By Dr. H. Magnus.

I.—ANATOMY.

1. Baumgarten. **The tubular glands, and the lymph-follicles in the human palpebral conjunctiva.** *A. f. O.*, vol. xxvi, 1. In the human conjunctiva there are numerous tubular glands, especially in the nasal third of the conjunctiva of both lids; they are also frequently met with in the outer third of the conjunctiva near the transition fold; the glands are less numerous in the middle third. A sharp anatomical distinction between the furrows and glands of the conjunctiva cannot be made, and the former must probably be regarded as modified glandular structures.

2. Beauregard. **Etude du corps vitre.** The vitreous is developed from connective tissue. *Journ. de l'Anat. et de la Phys.*, No. 3.

3. Emmert. **Eye and skull.** Researches on refraction, accommodation, the relations between certain measurements of the eyes and orbits, elongation of the axis and the mechanism of the movements of the eye. (Berlin, 1880.) The first part contains: 1, the maximum of accommodation at different ages and under different refractive conditions; 2, the distance between the two outer bony margins of the orbit at the level of the pupils; 3, the distance between the pupils; 4, the distance between the centre of the pupil and the outer bony margin of the orbit; 5, the average horizontal diameter of the iris by the average size of the pupil; 7, the prominence of the eyeballs with relation to age and refraction. In the second part: measurements of the orbit of human skulls in the horizontal and vertical planes. In the third part he speaks of the causes of my-

opia, and in the appendix he tries to give a physiological explanation of the pathological and physiological movements of the eyeball.

4. GALEZOWSKI observed **irideremia** in one family through several generations. Clinique Ophthalm., *R. d'O.*, February, 1880.

5. HEISRATH. The **avenues of exit of the aqueous humor,** with special consideration of the so-called Fontana's and Schlemm's canal. *A. f. O.*, vol. xxvi, 1. There is an active flow of aqueous through the meshes at the angle of the iris into the loose tissue of the ciliary muscle, of the connective-tissue stratum of the ciliary muscle, and the innermost layers of the sclerotic; but the main outlet is through open channels in the trabecular tissues of the iris-angle, Schlemm's canal, and numerous blood-vessels which perforate the sclerotic and take their course to the anterior ciliary veins.

6. MAGNUS. Defect of the lower lachrymal puncta on both sides. *C. f. A.* Congenital.

7. OBERSTEINER. The **central origin of some cerebral nerves.** *K. K. Gesellsch. d. Arzte zu Wien. Sitz.*, ii, Juni, 1880. *Wiener Med. Wochenschr.*, No. 25. He inclines to Duval's view, who says that in the nucleus of the abducens fibres originate which pass the median line with the posterior longitudinal bundle, then ascend to the nucleus of the oculomotorius and, without communicating with its cells, join the emerging bundles of the oculomotorius. They assist the oculomotorius in the supply of the internal rectus. The nucleus of the abducens of one side supplies, therefore, the rectus externus of one side, and partly the rectus internus of the other eye.

8. SALZER. The **number of optic-nerve fibres and retinal cones** in the human eye. *Wiener Sitzungsber.*, 81, Abth. 3. Salzer counts, on an average, 438,000 fibres in a transverse section of the optic nerve; the number of cones is said to vary between 3 and 3.6 millions.

9. SAMELSOHN. The **topography of the course of the fibres in the human optic nerve.** Upon anatomo-pathological experiments, S. inclines to the view, previously proposed by Magnus and others, that the nerve fibres which supply the macula take, at least at the optic foramen, their course in the centre of the nerve trunk. Their course is probably not perfectly straight, but toward the globe they pass gradually to the temporal side.

10. SCHLEICH. Ophthalmoscopical observation of cilio-retinal blood-vessels. Nagel, *Mittheil. aus d. Ophthalm. Klinik in Tübingen*, Heft 1, Tübingen, 1880.

11. SCHNELLER. The **nutrition of the retina.** *A. f. O.*, vol. xxvi, 1. The retinal vessels nourish sufficiently the layers of nerve fibres, ganglion cells, and the nervous elements of the inner granular layer; they can also supply both layers of granules and keep in a condition of *vita minima*, for a limited period, the layer of rods and cones. The vessels of the chorio-capillary layer supply the pigment layer, rods and cones, outer limiting membrane and the layer of outer granules.

II.—PHYSIOLOGY.

CORNEA, IRIS, CILIARY BODY.

12. LABORDE. Nouveau procédé de sectionner la branche ophthalmique de la cinquième paire sur le lapin. Presented to the *Acad. de Méd. de Paris*, May

4, 1880. Instead of the generally observed ulceration of the cornea, Laborde stated the appearance of hypopyon.

13. ZEHENDER. Attempt at **transplantation of a piece of cornea of a dog into the human cornea.** *Z. M.*, p. 189. The enucleation, four days later, showed that healing had not yet taken place.

14. MOOREN and RUMPF. **Vascular reflexes in the eye.** *Centralbl. f. d. Med. Wissensch.*, No. 19. If we cause, by artificial irritation, a hyperæmia of the iris in one eye, the other will show a distinct anæmia; after the irritation has passed off, a considerable injection follows the reflex-anæmia, whilst the iris, which had been hyperæmic by the irritation, becomes anæmic. If we produce artificially an anæmia of one globe, the iris of the other eye will show hyperæmia. The vessels of both eyes, therefore, are in intimate relation with each other, and this has been used by some observers for the explanation of certain forms of sympathetic ophthalmia.

15. AUGELUCCI and AUBERT. Researches on the length of time required for accommodation and for the accommodative change of curvature of the anterior lens-surface. *Arch. f. d. Ges. Phys.*, vol. xxii.

16. BISINGER. Researches on the relations between accommodation and the convergence of the visual axes. With additional remarks by Nagel. *Mittheil. aus d. Ophth. Klinik in Tübingen*, Heft 1, 1880.

17. SCHLIEPHAKE. The effect of **muscarine** upon the human eye. It causes an intense spasm of the ciliary muscle, and irritates the conjunctiva less than extract of calabar and physostigmine. *Mittheil. aus d. Ophth. Klinik in Tübingen*, Heft 1, 1880.

18. SCHMIDT-RIMPLER. The **velocity of accommodation** in the human eye. *A. f. O.*, vol. xxvi, 1. 1. With fixed convergence of the visual axes at 25 *cm.* the maximum accommodation requires 1.64 seconds; the subsequent reaccommodation for the point of convergence, 0.78 seconds. The maximum relaxation of accommodation requires 1.66 seconds; the reaccommodation for the point of convergence, 1.08 seconds. 2. With the same convergence of the visual axes, therefore, the total amount of accommodation from the relative far-point to the relative near-point requires 2.72 seconds, and the corresponding relaxation of accommodation, 2.44 seconds. 3. With a convergence of the visual axes at 6 *cm.* the maximum accommodation requires 1.46 seconds; the subsequent accommodation for the point of convergence, 0.92 seconds. 4. The reaccommodation for the point of convergence is always quicker than the corresponding change of the accommodation for either the positive or negative side.

REFRACTING MEDIA, RETINA, OPTIC NERVE AND CENTRAL ORGAN. PHYSIOLOGICAL OPTICS. COLOR-SENSE. OCULAR MUSCLES.

19. GRÜNHAGEN and JESNER. The **production of fibrine after nerve-irritation.** *C. f. A.*, p. 181. The chemical composition of the aqueous humor depends upon nervous influences. The aqueous eliminates a cogaulum of fibrine, after an irritation of the ophthalmic branch of the trigeminus. The irritation of the nerve is said to cause dilatation of the blood-vessels and consequently transudation of the fibrinous elements of the blood. In the non-irritated eye of the other side, however, there is also coagulation, but less pronounced. Compare the observations of Mooren on vascular reflexes, No. 14.

20. HEUBEL. Remarks npon Dr. Deutschmann's paper: The **action of hygroscopic substances upon the crystalline lens.** *Archiv f. d. ges. Phys.*, vol. xxi, Heft 3 and 4. For the formation of the real diabetic cataract, the presence of sugar in the aqueous and vitreous is of the greatest importance, since by it the fluid is removed from the lens. Comp. Deutschmann's answer: Does the presence of sugar in the fluids of the eye cause diabetic cataract by the withdrawal of water from the lens? *Arch. f. d. ges. Phys.*, vol. xxii.

21. SCHNABEL. Artificial and pathological hypotony. *Wiener. Med. Blätter*, Nos. 9–14.

22. ADAMS. A new instrument for illuminating and magnifying the anterior portions of the eyeball. *Lancet*, No. 6. It is a magnifying glass held by a forehead-band.

23. BADAL. Études d'optique physiologique. Influence du diamètre de la pupille et des cercles de diffusion sur l'acuité visuelle. *A. d'O.*, Jan., Févr., etc.

24. BADER. A simple ophthalmoscope. *The Lancet*, No. 6.

25. BEAUREGARD. Contribution to the study of the retinal purple. *Jour. de l'Anat. et de la Phys.*, p. 161.

26. BURGL. Optometer for quick determination of refraction, accommodation and acuteness of vision, with special regard to the fitness for military service; also to be used as a mask. *Illustr. Vierteljahrschr. f. ärztl. Polytechnik*, H. 2. *C. f. A.*, p. 104.

27. CARTER. Eyesight: good and bad. A treatise on the exercise and preservation of vision. London, 1880.

28. EXNER. Further researches on the **regenerative processes in the retina** and on **blindness by pressure.** *Arch. f. d. ges. Phys.*, vol. xx, p. 614. After the opinion of the author chemical processes take place in the retina during the visual act, by which substances accumulated in the retina are consumed. These substances are constantly reformed, as long as the circulation remains normal, but if the circulation is somehow impaired, for instance by strong pressure upon the globe, the regeneration of those substances is prevented or at least retarded. By pressure, therefore, the formation of an after-image can be made more difficult and even entirely prevented, and the duration of an after-image essentially shortened. If we look, with an eye which is blind by pressure, at a rotating disc with white and black sectors, which appears glittering to the normal eye, it will seem uniformly gray, grow darker, and darker, and will finally disappear entirely. If we look at two adjoining black and white surfaces and then press firmly upon the globe until the white surface appears quite dark, a white square, suddenly put upon the black surface, will be distinctly visible for a short time. The cause of this is that the half of the retina which has looked at the black surface, has, in spite of the pressure, a sufficient amount of those chemical substances to produce a perception.

29. FICK. First part: Dioptrics. Adnexa of the eye. Second part: The perceptions of light. *Hermann's Handbuch der Physiologie*, vol. iii, 1.

30. HERING. The sense of space and the movements of the eye. *Hermann's Handbuch der Physiol.*, vol. iii, 1.

31. HINTHLEY. Ophthalmoscopic optometry. *Rec. de Mém. de Méd.*, 1880, Jan., Févr.

32. HIRSCHBERG. Perimeter for binocular diplopia. *C. f. A.*, pp. 105 and 132. Division into degrees at the distance of one metre.

33. KÜHNE. Chemical processes in the retina. *Hermann's Handbuch der Physiol.*, vol. iii, 1.

34. LANDOLT. Télémètre à double prismes percés. Presented to the *Acad. des Scienc.*, March, 1880.

35. LANDOLT. On the enlargement of ophthalmoscopic images. *Brit. Med. Journ.*, Jan. 3, 1880.

36. MANOLESCU. Recherches relatives à l'étude de l'acuité visuelle ; conditions de la visibilité des lignes et des points. *Soc. de Biol.*, Febr. 7, 1880. *Gaz. Méd.*, No. 12. *A. d'Oc.*, vol. lxxxiii, p. 55. The visibility of points is proportionate to the quantity of light entering the eye.

37. MAUTHNER. Lectures on ophthalmology. No. 5. Functional examination of the eye. Far-point. Spectacles. Near-point and range of accommodation. Binocular vision. Optical defects. Wiesbaden, 1880.

38. MATTHIESEN. The geometrical figure of the theoretical retina of the periscopic diagrammatic eye. *A. f. O.*, vol. xxv, 4.

39. NAGEL. The optical enlargement by lenses and simple combinations of lenses with regard to the action of lenses and the ophthalmoscopic enlargement. *Mittheil. aus d. Ophthalm. Klinik in Tübingen*, Heft 1.

40. NAGEL. The notation of dioptric values and of the symmetric convergence after the metric system. *Ibidem.*

41. PICHA. The numeration of glasses according to dioptrics. *Militärarzt*, vol. xiv, No. 5. He does not approve of the dioptric system. Picha thinks that the only advantage of the metric system lies in the uniform measure.

42. PONCET attacks Snellen's test-types and recommends Javal's new tests. *Soc. de Biol.*, 1880. *Prog., Méd.*, p. 186. Hirschberg gives a striking refutation of Poncet's assertions. *C. f. A.*, p. 236.

43. PREYER. **Psychogenesis.** *Deutsche Rundschau*, 1880, May. The development of the sense of vision, pp. 213–216. The symmetry of the movements of the eye is not congenital, but is gradually acquired ; at first the movements are asymmetric. Before the third year the color-sense is not completely developed ; blue is the last color which is designated correctly. At first the visual field is composed only of indistinct light and dark spaces, and only the intensity of light is appreciated. Toward the end of the first month the child begins to fix its gaze and to accommodate.

44. SAMELSOHN. Traumatic aniridia and aphakia with preservation of sight, with remarks on the medial limits of the visual field. *C. f. A.*, p. 184.

45. SCHLEICH. The **absorption-spectra of cobalt-blue glasses.** *Mittheil. aus d. Ophthalm. Klinik in Tübingen*, Heft 1. The blue glasses are said to protect the eye better against bright light than the smoked glasses, since they shut out especially the bright rays of light ; but Schleich disregards entirely the characteristic effects which the different colors, and especially blue, have upon the retina. Just this latter quality makes the blue glass less apt to pro-

tect the eye. Schleich's examinations prove a quantitative protection by the blue light, but he does not disprove the qualitative unfitness of the blue glasses.

46. TALKO. Results of the determination of the visual acuteness of the soldiers in the military district of Warsaw. *Kronika Rekarska*, 1880, Nos. 2 and 3. 14,507 soldiers were examined; among the young ones S varied between 1½ and 1⅔; in a single instance S=3.

47. TROMPETTER. The **determination of quantitative perception of light in cataractous eyes.** *Z. M.*, p. 83. The examination with the photometer has the great advantage of convenience and accuracy. A cataractous eye, which, with the intensity of light of the optometer placed at 32 *mm*, has no perception of light, may be regarded as complicated.

48. MAUTHNER. **Soul-blindness and hemianopia.** *K. K. Gesellsch. der Arzte. zu Wien.*, June 4 and 11, 1880; *Wiener Med. Blätter*, No. 25; *Wiener Med. Wochensch.*, No. 25. Soul-blindness does, after Mauthner, not exist in the sense as defined by Munk, but is caused by the loss of central vision in consequence of the destruction of a portion of the cortex cerebri.

49. MUNK. The visual centres of the cortex cerebri. *Monatschr. d. Kgl. Acad. d. Wissensch. zu Berlin*, May, 1880.

50. ALMQUIST. Studier öfver Tschuktschernas färgsinne. *Kgl. Vetenskaps. Akad. Förh.*, 1879, Nov. 9, and Studien über den Farbensinn der Tschuktschen. At the request of the author, translated into German, with the addition of a postscript by Dr. Magnus. *Breslauer, ärztl. Zeitschr.*, No. 14, *et seq.* The examination of about three hundred persons gave the following results: The Tschuktschians have organs for the discrimination of colors, but they are not used to pay special attention to colors, and the only color they distinguish definitely is red. They comprehend all the tints of red as one color, but they say that a moderately bright green comes nearer to a blue of the same intensity than to a less-bright green. In order to comprehend all the shades of green, they must learn to make an entirely new abstraction. It is striking how much more attention the Tschuktschian pays to the intensity of light than to the shade of color.

51. BERGER. Hypnotic conditions and how they are brought about. *Breslauer ärztl. Zeitschr.*, 1880, Nos. 10–12. It is stated that color-blindness is temporarily cured not only by warmth applied to the eye, but also by intense irritation of the skin, as pinching of a fold of skin, cutaneous faradization, etc.

52. H. COHN. The disappearance of color-blindness after warming the eye. *Deutsche Med. Wochenschr.*, No. 16. Three distinctly color-blind persons are said to have lost the color-blindness for a moment by warming the eye.

53. H. COHN. Hypnotic color-blindness with spasm of accommodation, and methods to hypnotize the eye alone. *Breslauer, ärztl. Zeitschr.*, No. 6.

54. DREHER. Theory of the perception of colors. *Natur*, 1880, No. 21, *seq.* He prefers Young-Helmholtz's theory, but takes red, yellow and blue as the fundamental colors. Color-blindness results from an insufficient morphological development of the cones, by which the function of their nervous elements is impaired.

55. DREHER. Contributions to the theory of the perception of colors.

In *Beiträge zu einer exacten Psycho-Physiologie. Halle*, 1880. The color-sense has been gradually developed at a very early period of the human race. By the action of the visual purple the rods are said to have been transformed into cones, and that thus the color-sense was developed.

56. HEIDENHAIN and GRÜTZNER. Half-sided hypnotism. Hypnotic aphasia, color-blindness and deficiency of the color-sense in hypnotized persons. *Breslauer ärztl. Zeitschr.*, February 1, 1880.

57. HEIDENHAIN. Critical contributions to the experiments on hypnotism. *Breslauer ärztl. Zeitschr.*, March 13, 1880. He states that gentle stroking of the forehead and temples produces one-sided color-blindness and spasm of accommodation. Blue and yellow, and light-red and green are confounded. After the instillation of atropine the hypnotized eye recognizes yellow and blue again, though not distinctly, but remains insensible to green and red.

58. JEFFRIES. Report of the examination of 27,927 school-children for color-blindness. *School Document*, No. 13, Boston, 1880. 14,469 male and 13,458 female children were examined after Holmgren's method; 608 male children were color-blind, = 4.202 per cent., and 9 females, = 0.006 per cent. He recommends Magnus' system for the education of the color-sense.

59. KIRCHHOFF. **The color-sense of the Nubians** and their notation of colors. *Zeitschr. f. Ethnologie*, vol. xi, 6. The examination shows the following results: It is neither an imperfection of the color-perception nor of the language, but indifference which has led the Nubians and many other, mostly African, tribes not to separate certain colors, especially blue and green.

60. KRENCHEL. The hypotheses of the fundamental colors. *A. f. O.*, vol. xxvi, 1. The assumption of three as well as of two fundamental colors is said to be untenable.

61. MAGNUS. Examination of the color-sense of uncivilized tribes. Preyer, *Sammlung physiologischer Abhandl.*, vol. ii, 7.

62. PESCHEL. Experiments on the adaptation of the retina for colors. *Arch. f. d. ges. Physiol.*, vol. xxi. The results can be explained neither by Helmholtz's nor by Hering's theory.

63. PFLÜGER. Plates for the determination of color-blindness. Berne, 1880. He declares that both the old and new plates of Stilling are unreliable, but Holmgren's method, applied by an expert, is perfectly satisfactory. It can lead to errors only when mechanically applied by a layman, when the examination is made with artificial light, and when the collection of woollen samples does not contain a sufficient number of shades of red and green. Pflüger tries to obviate these difficulties by plates constructed after the principle of the crape contrast.

64. SCHÖLER. Ophthalmoscopic examination of Nubians and negroes. *Zeitschr. f. Ethnol.*, vol. xii, 1. The visual fields for different colors are the same as in Europeans, that is, the one for green is the smallest, then follow red, blue, white. On the temporal side, however, the perception of colors reaches farther than in Europeans.

65. TSCHERBATSCHEFF. The **action of the constant current on the normal eye**. *Inaug.-Dissert.*, Berne, 1880. The peripheric perception of colors is increased considerably; for blue and red about 15°, for yellow and

green about 10°. The examination of the central vision was negative, but the visual field on the whole was greatly enlarged for a period of about two weeks.

66. ABADIE. Note à l'appui de l'hypothèse de M. Landouzy sur l'existence d'un contre-rotateur des yeux. *Progr. Méd.*, 1880, No. 4.

67. DUVAL et LABORDE. De l'innervation des mouvements associés des globes oculaires. *Journ. de l'Anat. et de la Phys. par Robin et Pouchet*, 1880.

III.—THERAPEUTICS.

MEDICAMENTAL THERAPEUTICS.

Atropine and Homatropine, Duboisine, Eserine, Pilocarpine, Strychnine.

68. ANREP. Chronic atropine-poisoning. *Arch. f. d. ges. Phys.*, vol. xxi, pp. 5 and 6.

69. CARRERAS-ARAGÓ. Symptoms of **poisoning by** a hypodermic injection of nitrate of **strychnia,** and instantaneous cessation of the muscular spasm of the chest upon the application of the electro-magnetic current. *C. f. A.*, p. 113. The dose was fifteen drops of a 1-per-cent solution (¼ grain).

70. DONATH has observed, after instillation of atropine, erysipelas of the lids and eczema of the face and neck. *Wiener Med. Wochenschr.*, No. 12.

71. EMMERT. Symptoms of **poisoning** after the injections of **strychnine.** *C. f. A.*, p 179. Fifteen drops of a 1-per-cent. solution of strychn. acet. had been used.

72. DA FONSECA speaks of the good results of the use of eserine in acute glaucoma. *Arch. Ophthalmothérapico de Lisbon*, 1880, January, February.

73. FUCHS. **Homatropinum hydrobromatum.** *C. f. A.*, p. 182. It produces mydriasis more quickly than weak solutions of atropine, and also disappears more rapidly than after atropine. As to accommodation there is hardly any difference between atropine and homatropine. Homatropine is said not to cause any eruptions.

74. GALEZOWSKI. Le collyre d'ésérine dans les kératites et le glaucome. *R. d'O.*, 1880, No. 3.

75. GROSKOT. De l'action physiologique de la strychnine et de quelques-uns de ses composés comparée à celle du curare. *Thèse de Paris*, 1880.

76. GUAITA. Il collirio d'eserina nelle cheratiti e nel glaucoma. *A. d'Ott.*, vol. ix, 1.

77. SCHENKL observed in one case twice conjunctivitis and eczema of the lids after the use of atropine; duboisine produced only conjunctivitis, no eczema. *Prager Med. Wochenschr.*, No 19.

78. SCHLEGEL. **Eserine** as a remedy **for glaucoma.** *Mittheil aus d. Ophthalm. Klinik in Tübingen*, vol. i. Eserine produces in some cases a marked, in a few cases a very considerable and even lasting improvement of central vision, with a reduction of the abnormally increased pressure and an amelioration of other glaucomatous symptoms. The field of vision becomes larger again rarely. The therapeutic action, therefore, is a regression of the

glaucomatous symptoms and in some cases even a lasting improvement, and in such cases we may well call it a cure. In the cases in which the improvement is only temporary, its value lies chiefly in preparing favorably for the iridectomy, since the operation is not only easier to execute, but the dangers for the eye are much less with reduced than with increased intra-ocular tension.

79. TWEEDY. On the mydriatic properties of **homatropine** and **oxytolyltropeine** with an account of its general physiological action, by Sidney Ringer. *Lancet*, No. 21.

80. VÖLCKERS recommends homatropine in cases where we desire a mydriasis only for diagnostic purposes. *C. f. A.*, p. 203, and *Schleswig-Holstein'sches Vereinsblatt*, March.

81. WINDELSCHMIDT. The effects of pilocarpine in a case of retinitis. *Allg. Med. Centralzeitung*, May 19, 1880.

ANTISEPSIS.

82. ANDREWS. Boracic acid contaminated with lead. *Med. Rec.*, vol. xvii, No. 12. He calls attention to the fact that boracic acid frequently contains lead salts.

83. FRÖHLICH. **Antisepsis in operations on the eye.** *Z. M.*, p. 115. Before every operation all the instruments should be dipped into absolute alcohol, and then moistened with distilled water and wiped with soft linen. During and after the operation, preparations of boracic acid, borated lint, borated cotton, borated gauze, and a 4-per-cent. solution of boracic acid, should be employed. Borated cotton is used to wipe off the blood during the operation. After the operation the lids are washed with the solution of boracic acid and then covered with moistened borated lint; upon this is placed borated cotton, and then the flannel roller bandage is applied. The preparations of boracic acid are said to be the best disinfectants in ocular surgery.

84. SNELL. **Phenylic acid** irritates the conjunctiva and protracts the recovery after cataract extractions; he recommends thymol., 1:1,000. *Brit. Med. Journ.*, Feb. 14.

85. STRASSER. Contributions to the use of **disinfectants in ophthalmology.** *Inaug.-Dissert.*, Berne. After experiments upon animals the following preparations only seem to be adapted to ophthalmic praxis: a 4-per-cent. solution of boracic acid, a 5-per-cent. solution of benzoate of soda and chlorine water.

86. THEOBALD recommends boracic acid in blennorrhœa and scrofulous ophthalmia. *Med. Rec.*, vol. xvii, No. 6.

DIVERSA.

87. ANDREWS recommends powders for the treatment of conjunctival affections. *Arch. of Med.*, New York, vol. ii, 3.

88. BADER. A new treatment of gonorrhœal ophthalmia. *Lancet*, No. 18. A salve of hydr. oxyd. nitr. 0.06, daturine 0.012, vaseline 30.0 applied under the upper lid and upon the outside of the lids.

89. BALEZEWSKI. Contribution à l'étude du traitement de la tumeur lacrymale. *Thèse de Paris*, 1880.

90. BROWN. Affections of the eye following the use of chloral. *Med. Rec.*, vol. xvii, No. 13. After the use of chloral, swelling of the lids and conjunctival injection were observed.

91. CRITCHETT. Gonorrhœal ophthalmia, with some novel suggestions as to treatment. *Lancet*, No. 14.

92. DOR. Traitement de la conjonctivite blénnorrhagique. *Lyon Méd.*, March 7, 1880.

93. GALEZOWSKI. Du traitement de la sclérite et de la scléro-kératite. *R. d'O.*, 1880, No. 5. Atropine and eserine alternately. Blisters upon forehead and temples. Steam directed against the eye. Internally, iodide of potassium or salicylic acid. Sometimes incisions into the circumscribed swellings of the sclerotic.

94. GATTI observed **amaurosis after** the use of **salicylate of soda.** *Gaz. degli Ospital.*, vol. i, 4.

95. GAYET. Papillome cornéen guéri par la poudre d'alum. *Rev. Méd.*, No. 4.

96. GREENWAY treats glaucoma with ice. *Brit. Med. Journ.*, Jan. 31.

97. HAYER. Iodoform in diseases of the eye. *Journ. de Pharm. et de Chimie*, serie v, 1. Applied to corneal ulcers direct; in affections of the lids as a salve, 1 part of iodoform to 4 parts of vaseline.

98. HOTZ. The value of salicylic acid in the treatment of rheumatic diseases of the eye. *Chicago Med. Journ.*, vol. xl, No. 5.

99. HOWE recommends in one-sided blennorrhœa to apply a piece of mica over the healthy eye. *Buffalo Med. and Surg. Journ.*, vol. xix, No. 7.

100. POLI. The influence of sea-baths upon scrofulous ophthalmia. *Gaz. Med. Ital. pro Venete*, Padova, vol. xxiii, p. 25.

101. PUEL. De la dacryocystite et de son traitement. *Thèse de Paris*, 1880.

102. SIKORA. Étude critique sur le traitement de l'ulcère rongeant de la cornée. *Thèse de Paris.*

103. TWEEDY. On the treatment of diphtheritic ophthalmia by local applications of solutions of quinine. *Lancet*, No. 8.

PHYSICAL THERAPEUTICS.

Electro-Therapeutics and Actual Cautery.

104. AGNEW and WEBSTER. The alleged **cure of cataract by electricity.** The statements of Neftel were not confirmed by the later examination of the patient. *Med. Record*, vol. xvii, No. 20.

105. "CHURCHMAN." The editor of the *Churchman* (a religious paper) claims in a letter to the editor of the *Med. Record* his right to make further publications upon the astonishing results of the treatment of cataract by electricity. *Med. Record*, vol. xvii, No. 13. The reviewer begs to call attention to the fact that in the first third of this century, there was a great excitement

over the cure of cataract by electricity, but without any foundation. Comp. Magnus, "Geschichte des grauen Staares." Leipzig, 1876.

106. COURSSERANT. Mémoire sur la cautérization au fer rouge en thérapeutique oculaire. *Franc. Méd.*, Nos. 30 and 33. C. presented on Jan. 22, 1880, to the Soc. de Méd. two cases of corneal affections which had been cured by cauterization.

107. DA FONSECA has treated optic neuritis successfully by the constant current. *Arch. Ophthalm. de Lisbon*, 1880, Jan., Febr.

108. KNAPP. **Neftel's alleged cures of cataract by electricity.** *Med. Record*, vol. xvii, p. 24. The patient was neither cured nor even benefited, but had become near-sighted; the so-called "second sight" of old people almost always indicates cataract.

109. NEFTEL. The **galvanic treatment of incipient cataract.** *Virchow's Archiv*, vol. lxxix, Heft 3. He states that after a methodical galvanic treatment all the symptoms of cataract had entirely disappeared and full acuteness of sight was restored. He claims also a cure of a detachment of the retina, and recommends his procedure in all progressive diseases of the retina, choroid and optic nerve, and in glaucoma. The galvanic current is said to produce considerable variations of the intra-ocular tension, thus initiating the removal of opacities of the lens and capsule.

110. NIEDEN. The use of **electrolysis in ophthalmo-therapeutics.** *A. f. A.*, vol. ix. He claims the following advantages for this method: 1. It can be used where the removal of neoplasms by other methods is impossible or uncertain. 2. Neoplasms can be removed without loss of substance of the skin. 3. The effect of the operation can be accurately limited by the number of elements, needles, etc. 4. There is but little hemorrhage and pain. 5. Electrolysis has not proved effective in clearing up corneal opacities and in absorbing cataract. The original paper, p. 26 of this volume.

111. RENÉ. The treatment of erectile tumors of the lids and of the conjunctiva by electrolysis. *Gaz. des Hôp.*, No. 11.

112. TSCHERBATSCHEFF, comp. No. 65.

Magnet.

113. FRÄNKEL. Removal of a piece of iron from the vitreous chamber by a scleral section and the magnet. *C. f. A.*, p. 37.

114. GRÜNING. On the removal of particles of steel or iron from the vitreous chamber by means of magnets. *Med. Record*, vol. xvii, No. 18.

115. HIRSCHBERG and VOGLER. Foreign bodies in the interior of the eye, with remarks on optico-ciliary neurotomy. These ARCHIVES, vol. ix, p. 386.

116. HIRSCHBERG. The removal of a piece of steel from the eye. *Berl. Klin. Wochenschr.*, No. 16.

117. POOLEY. On the detection of the presence and location of pieces of steel and iron in the eye, by the indication of a magnetic needle. These ARCHIVES, vol. ix, pp. 219 and 255.

OPERATIVE THERAPEUTICS.

Cataract.

118. BADAL. Sur un procédé particulier de l'opération de la cataracte. *Journ. de Méd. de Bordeaux*, Jan. 10, 1880.

119. DE BONEN. De la cloralizacion en la extraccion de las cataractas. Badajoz, 1880.

120. BORYSIEKIEWICZ. Contributions to the extraction of cataract in adults. *Z. M.*, p. 199.

121. CARTER discusses the suction method. *Lancet*, No. 2.

122. CULBERSTON calls attention to the advantages of Knapp's method. *Cincinnati Lancet and Clinic*, p. 255.

123. GALEZOWSKI. Études sur les cataractes et sur leur traitement. *R. d'O.*, Nos. 4 and 5.

124. v. HASNER. The extraction of cataract. *Prager Med. Wochenschr.*, Nos. 8 and 9. Critical review of the results of the modified linear extraction during the last 14 years; he declares himself against it and in favor of the flap extraction.

125. HIGGENS. 150 cataract extractions. *Med.-Chir. Transactions*, vol. lxii, p. 347.

126. JONES. On operation for cataract by discision from behind. *Lancet*, No. 25.

127. VAN DER LAAN. Novo processo de discisao de cataracta congenita completa. *Period. de Ophth.*, vol. ii, No. 1.

128. TEALE. Cataract operation by suction. *Lancet*, No. 1.

129. WICHERKIEWICZ. The application of ice after the extraction of cataract. *Z. M.*, p. 4.

Neurotomy and Enucleation.

130. ABADIE. De la section extraoculaire des nerfs optique et ciliaires substitués à l'énucléation du globe oculaire. Soc. de Chir., Nov. 19, 1879. *Gaz. hebd.*, March 12, 1880.

131. BERGER. Cases of optico-ciliary neurotomy. *Baierisches Arztl. Intelligenzhl.*, vol. xxvi.

132. CHISOLM. Sympathetic amblyopia, rapidly destroying sight; prompt relief by neurotomy of the optic and ciliary nerves of the lost eye. *New York Med. Jour.*, No. 3. The secondarily affected eye could not read any more Jaeg. xx, and obtained full acuteness of sight within two weeks after the neurotomy.

133. HÄNEL demonstrated two cases of neurotomy in the Dresdener Gesellsch. f. Natur. u. Heilkunde, Jan. 10, 1880. *Deutsche Med. Wochenschr.*, No. 24. Both cases showed distinct sympathetic affection of the healthy eye; after the neurotomy the pain and sympathetic irritation disappeared. In a third case the neurotomy was followed by so much bleeding that the eye had to be enucleated.

134. HIRSCHBERG and VOGLER. These ARCHIVES, vol. ix, p. 386. After neurotomy the eye frequently becomes painful again, even after a year. If there is a foreign body in the eye, enucleation is to be preferred.

135. LOISEAU. Neurotomia optico-ciliaris. Literature of 1879-80. *A. d'O.*, May, June, p. 296.

136. MENGIN. Observations cliniques. *R. d'O.*, 1880, No. 1. The beginning sympathetic ophthalmia was cured by neurotomy.

137. SAMELSOHN has repeatedly observed the recurrence of ciliary neuralgia and was finally obliged to enucleate the eye; in one case the eye became painful again after 3 weeks, in another after 9 months. *C. f. A.*, p. 202.

138. WARLOMONT. Resection of the optic and ciliary nerves. *Presse Méd.*, vol. xxxi.

139. WILLIAMS. Neurotomy of the optic and ciliary nerves as a substitute for enucleation of the eyeball. *Boston Med. and Surg. Journ.*, vol. cii, No. 4.

Operations on the Lids and Lachrymal Apparatus.

140. CLÉMENT. Contributions à l'étude du traitement de l'ectropion muqueux. *Thèse de Paris.*

141. GIRAUD-TEULON presented to the Soc. de Chir., Febr. 4, 1880, a dacryotome which consists of a small knife within a Bowman's probe; the knife is pushed out by a spring. *Progr. Méd.*, No. 6.

142. KNAPP. Tumors of the lachrymal gland; their pathology and treatment. *Med. Record*, vol. xvii, No. 23, and *Transact. Am. Med. Asso.*, 1880.

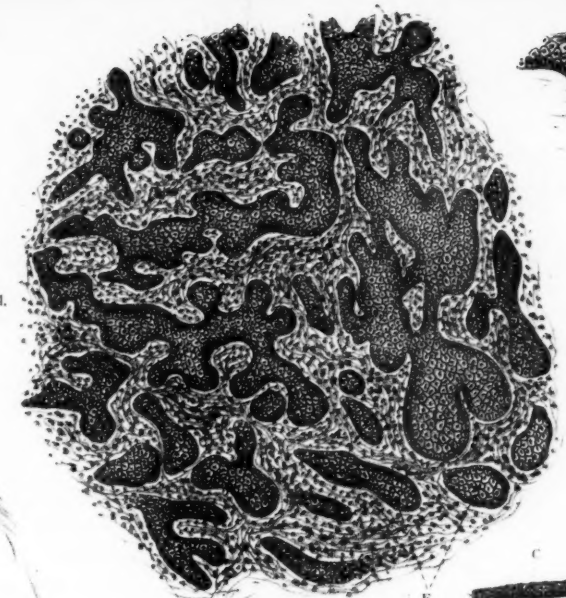
143. MACFARLAN. A new operation for symblepharon and permanent cure. *Med. Record*, vol. xvii, No. 15.

144. NOYES. Formation of an eyelid by transfer of a large piece of skin, without pedicle. *Med. Record*, vol. xvii, No. 13.

145. VON REUSS. Blepharoplasty. *Eulenburg's Real-Encyclopædie*, vol. ii.

146. SNELL. Case of ectropion treated by a naso-buccal flap, and other cases. *Lancet*, No. 16.

Fig.a.



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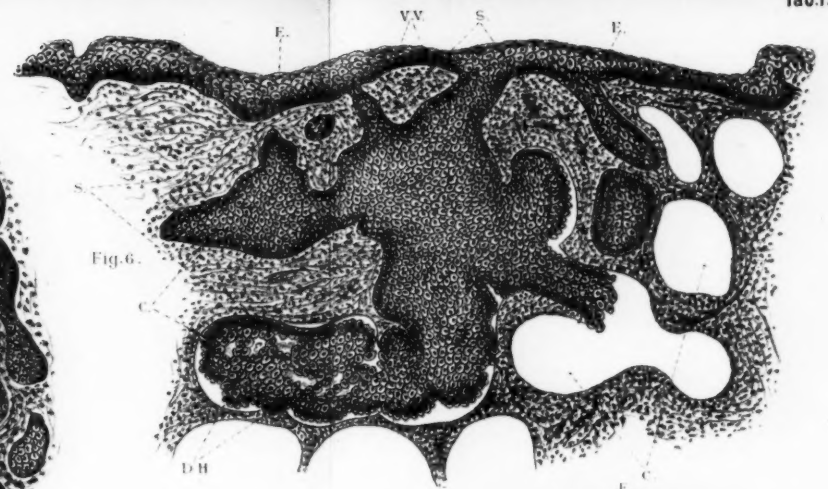

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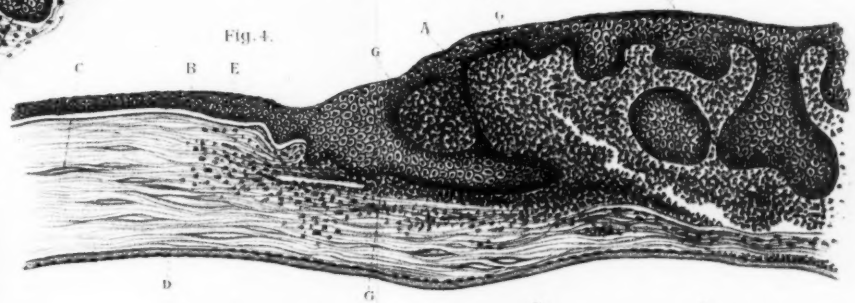

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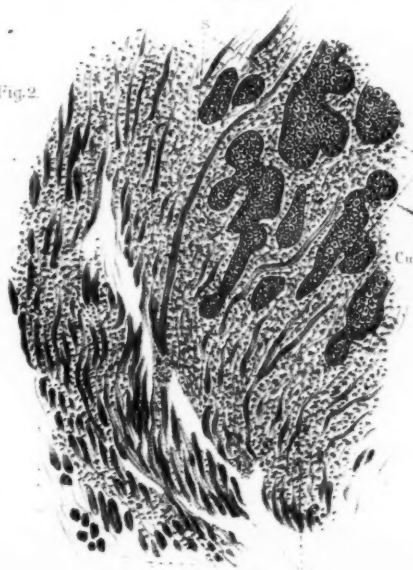

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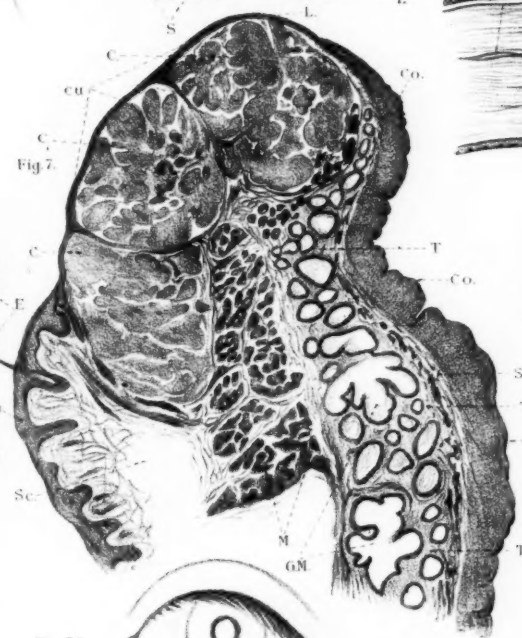

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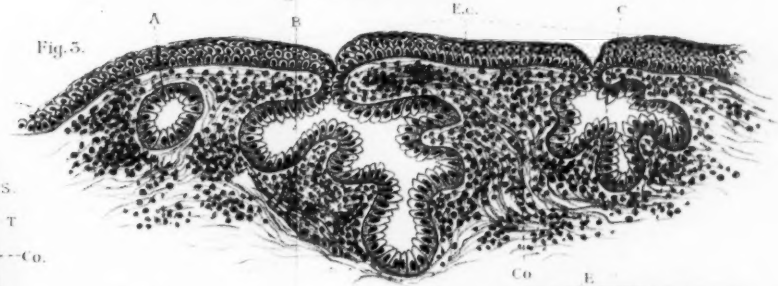


Fig.3.

Fig.7a

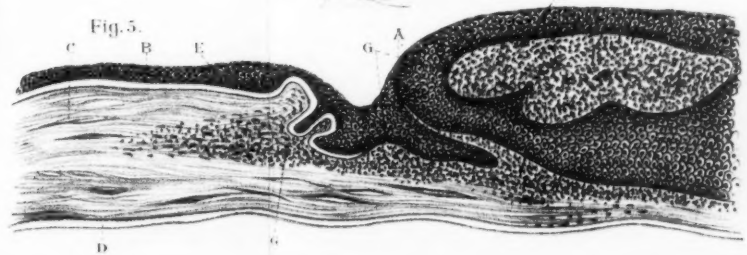


Fig.5.

Fig. 1.

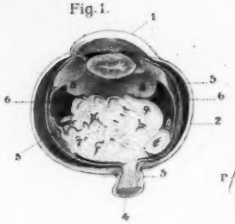
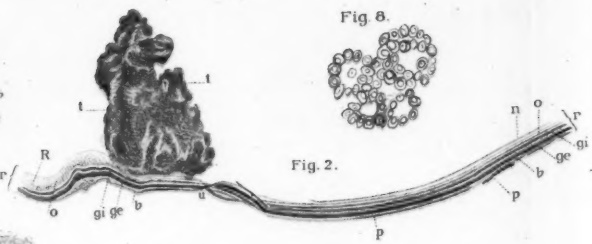


Fig. 8.

Fig. 2.



9A.

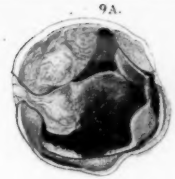


Fig. 9.

9B.

Fig. 7.

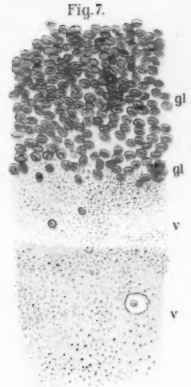


Fig. 10.

Fig. 3.

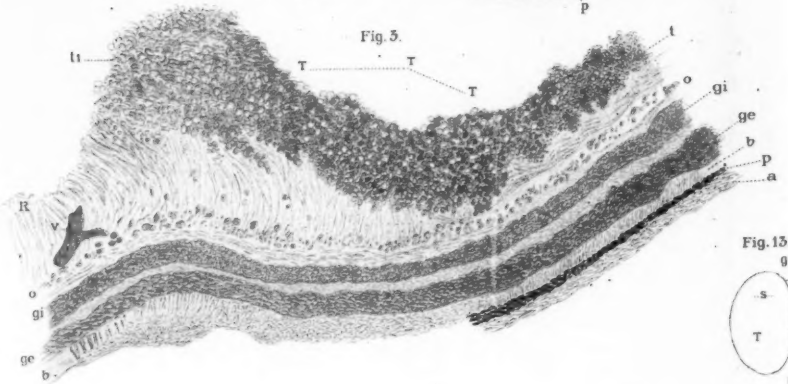


Fig. 11.

Fig. 13.

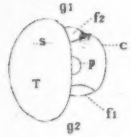
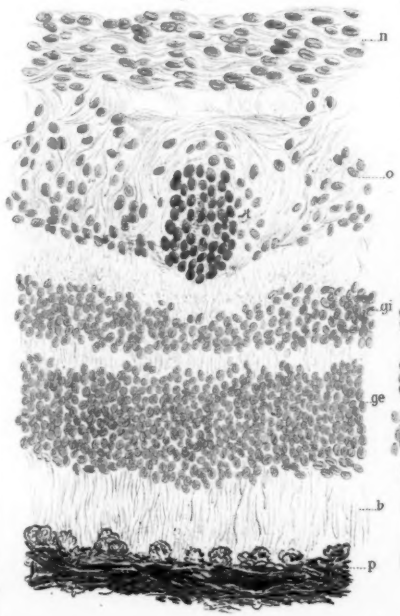


Fig. 14.

Fig. 4.



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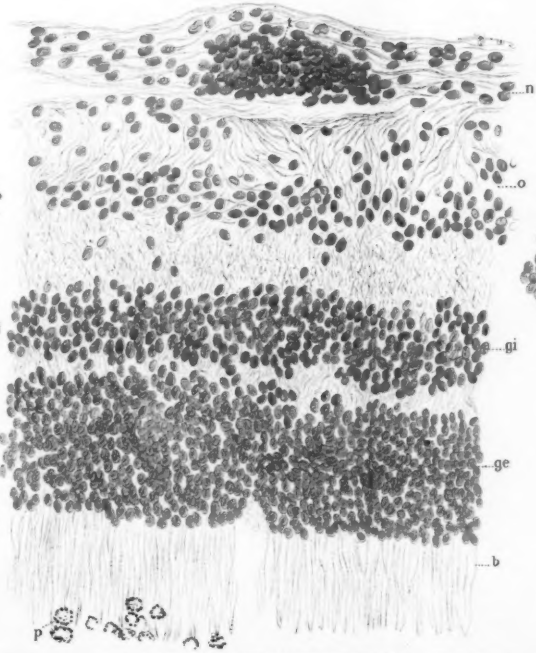

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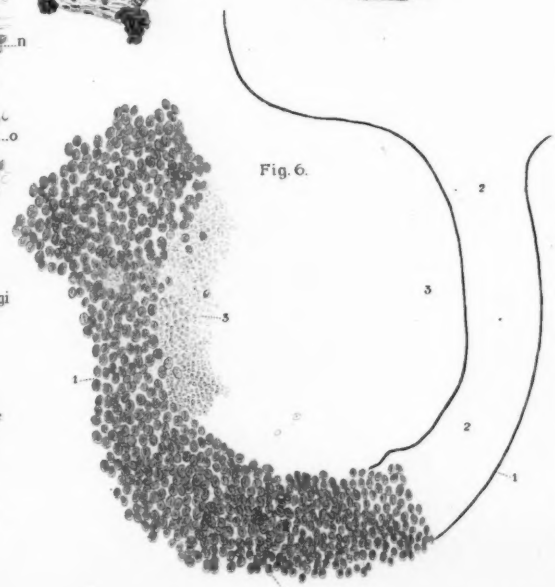

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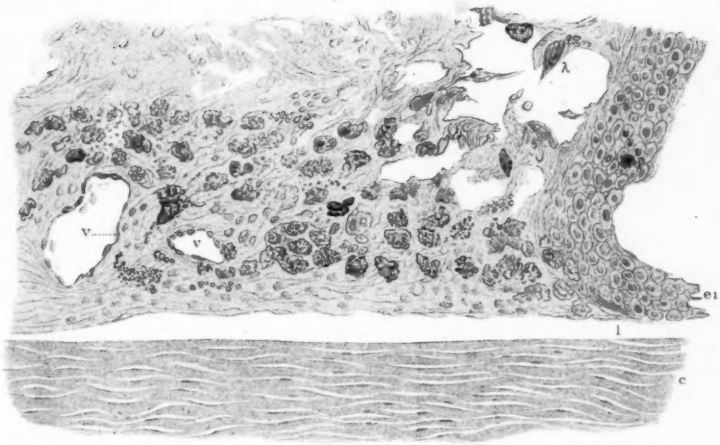
Fig.14.

Fig.15.



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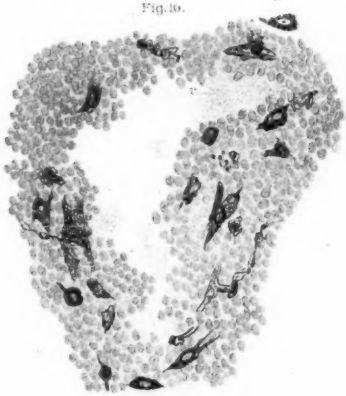

Fig.17.